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Contents

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Contributions should be submitted to the Editor, Journal of the Royal Naval Medical Service, Institute of Naval Medicine, Alverstoke, Hants PO12 2DL, who will arrange for any necessary revision. [illegible] Royal Naval Medical Branch personnel is drawn to the provisions of QRRN Article 68X para 6.

Manuscripts should be prepared in the Vancouver style. They should be typewritten in double spacing and wide margins and should include: title page, abstract (of not more than 150 words), introduction, method, results, discussion and references, each section commencing on a separate page. A count of the length is between 2000 and 3500 words, plus essential tables or illustrations.

Tables and illustrations should be referred to in the text. Tables should be typed in double spacing on separate sheets. Figures should be professionally drawn, making due allowance for the appropriate reduction. Glossy black and white photographs should be submitted, unmounted, whenever possible. Titles and detailed explanations should be given in the legends which should be typed on a separate sheet.

References should be numbered consecutively in the order in which they are first mentioned in the text. At the end of the article the full list of references should give the names and initials of all authors (unless more than six, when only the first three should be given followed by *et al*). The authors' names are followed by the title of the article, the title of the journal abbreviated according to the style of *Index Medicus*, year of publication, volume number, and first and last page numbers. Titles of books should include the following: the place of publication, the publisher, and the year, e.g.

> Soter NA, Wasserman SI, Austen KF. Cold urticaria: release into the circulation of histamine and eosinophil chemotactic factor of anaphylaxis during cold challenge. *N Engl J Med* 1976; **294**: 687–90.
>
> Dahlin AG. *Contact urticaria and its treatment*. Englewood Cliffs: Prentice Hall, 1976.

1 The Vancouver Style. *J Am Med Assoc* 1979; **65**: 17–9.
2 International Committee of Medical Journal Editors. Uniform requirements for manuscripts submitted to biomedical journals. *Br Med J* 1982; **284**: 1766–70.

NOTICE

The Journal of the Royal Naval Medical Service is published three times a year in March, July and November) on 1 January, comprising three issues. The rates of subscription are:

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The Gulf War

The recent period of tension in the Gulf area, culminating in the brilliantly successful air and land force campaign, has been widely publicised by all sections of the media. The maritime achievements of the RN Task Group because of the disparity in numbers engaged in Naval operations as compared with those that were land based have predictably been overshadowed.

Nevertheless from any point of view the efficiency of the screening of capital ships from missile and mine attacks and the destruction of the enemy's seagoing offensive capability without loss of vessel or life ranks as an outstanding achievement.

Happily all elements of the medical nursing and dental personnel were spared the need to perform professional heroics but they did provide that tangible but unquantifiable boost to morale just by being there, their impact being the same whether serving in individual ships or as part of the Primary Casualty Receiving Ship's medical teams based in their purpose built medical facility aboard RFA *Argus*.

A less publicised occurrence was the fact that in addition, the Royal Navy contributed to the medical support of the land forces in the form of surgical and nursing teams integrated within an RAMC field hospital. The Medical Officers having been recalled from Higher Professional Training secondments in order to plug the RAMC gaps.

The personnel of the Royal Naval Medical Service deployed to the Gulf included QARNNS and also WRNS DSAs and were drawn in large part from the base hospitals and UK establishments all of which were already suffering chronic undermanning. This caused considerable further stretch in particular within duty rosters despite delaying the release of regulars at their terminal dates, the recall of Royal Fleet Reserve medics and others of the RNR to the colours. Welcome as these measures were they could not prevent a reduction in the overall primary care and secondary support provided in UK despite employment of the reservists in home hospitals.

What did you do in the war daddy (or mummy)?"—an innocent enquiry posed many times in the past by the children of successive generations of Servicemen and women. Personnel from all components of the RNMS might like to reflect how they would answer this question. As members of the Armed Force that has a tradition of reticence some may find it difficult to articulate a reply that does justice to their contribution to the grand plan. All should draw comfort whether they as individuals remained in the rear party or were thrust into the potential cauldron of the sharp end activities from the fact that they contributed with flair and ingenuity in the best traditions of the Royal Naval Medical Service and did so with confidence and great professionalism.

The Editor will welcome articles and professional commentary based upon the experiences of RNMS personnel during all phases of the preparation for and execution of the medical support tasks necessitated by the Gulf War

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Malignant Ameloblastoma? A case report and review of literature outlining problems in diagnosis and treatment

D W Matear and T C Crewe

Abstract

This paper reviews the literature on the clinical and histological diagnosis of both malignant ameloblastoma and ameloblastic carcinoma. The problems of existing classifications are emphasised and guidelines as to clearer, simpler classification are suggested. The case history emphasises the need for a clear classification between malignant ameloblastoma and ameloblastic carcinoma.

INTRODUCTION

Cases of malignant ameloblastoma have occasionally been reported. Small and Waldron[1] listed 33 cases of malignant ameloblastoma the diagnosis of some of which were not accepted by subsequent investigators who found five to be proven malignant, 12 not malignant and five of doubtful malignancy. This disagreement was probably due to the lack of clear guidelines for diagnosis of this lesion. The incidence of malignant ameloblastoma among ameloblastomas has been estimated at approximately 2% as a direct consequence of the problems of proper diagnosis both clinically and histologically.

It has been stated that a diagnosis of malignant ameloblastoma depends upon demonstration of metastatic lesions[2] but Corio *et al*[3] objected to this and gave guidelines for differential diagnosis between so-called malignant ameloblastoma and ameloblastic carcinoma (*Table 1*).

According to Shear[4] ameloblastic carcinoma may occur at any age but the majority arise in the sixth and seventh decades. Ninety per cent occur in the mandible with males being twice as susceptible as females.

Some authors claimed that the WHO classification in 1972[2] for odontogenic carcinomata (*Table 2*) did not make provision for separating tumours that are:

a Histologically identical to classical ameloblastoma and which metastasise and
b The ameloblastoma like lesions that are histologically malignant before metastasising.

Elzay[5] proposed a modification to the WHO classification (*Table 3*).

CASE REPORT

A 75 year old caucasian male was referred by his General Dental Practitioner to the Oral Surgery Outpatients Department because of a huge ulcer on the gingival overlying the lower left quadrant of his mouth (*Fig 1*).

His history was somewhat vague and it seemed that the lesion had been present for some time. The patient presented with tenderness on the left side of the lower lip, a dry mouth and chronic periodontal disease. He had recently extracted his own teeth in the lower left quadrant. There were no signs of lymphadenopathy, tenderness or swelling of the glandular tissues. His past medical history recorded that he had previously suffered from tuberculosis and currently had chronic bronchitis. He was a regular smoker and used alcohol frequently.

Surgeon Lieutenant Commander (D) Matear is currently appointed to HMS *Neptune*. Mr Crewe is a retired Consultant Oral Surgeon.

Table 1 Differentiation between malignant ameloblastoma and ameloblastic carcinoma (Corio *et al*[2])

Malignant ameloblastoma	Ameloblastic carcinoma
Benign or typical histology in both primary and metastatic lesions	Histological evidence of malignancy in primary or recurrent tumours regardless of metastases
Metastasises	

Table 2 WHO Classification 1972[3]

Classification of odontogenic carcinomas
1 Malignant ameloblastoma
2 Primary intraosseous carcinoma
3 Other carcinomas arising from odontogenic epithelium including those arising from odontogenic cysts

Table 3 Elzay[4] 1982 Modification of WHO classification

Type 1	Arising from odontogenic cyst
Type 2	Arising from ameloblastoma
	a Well differentiated (malignant ameloblastoma)
	b Poorly differentiated (ameloblastic carcinoma)
Type 3	Arising de novo
	a Non-keratinizing
	b Keratinizing

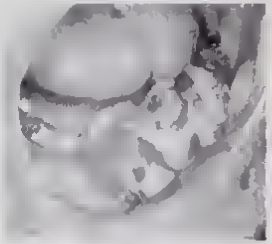

Fig 1 Intra-oral view of lesion

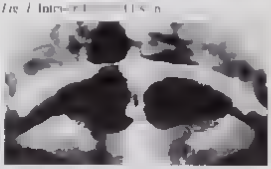

Fig 2 Pre-operative orthopantomogram showing large radiolucency in the lower left quadrant.

The patient was not considered a good candidate for general anaesthetic because of his poor general condition. The orthopantomogram (*Fig 2*) demonstrated a fairly well defined radiolucency with a multilocular appearance on one side which is consistent with the diagnosis of ameloblastoma.

A biopsy revealed an infiltrating malignant neoplasm with a high mitotic rate, part of which resembled infiltrating squamous cell carcinoma but with part showing an ameloblastic appearance. The histological slides (*Figs 3* and *4*) show islands of tumour cells with peripheral palisading typical of ameloblastoma with a dark chronic inflammatory infiltrate of the surface epithelium. The irregular islands of cells are typical of a malignant lesion.

The patient was initially treated with radiotherapy with the possibility of surgery in mind at a later date and was followed up two months later when it was reported that he had no pain and that the lesion was much reduced in size but that there was a residual ulcerated lesion of the ridge and floor of the mouth which was firm to touch. No lymph glands were enlarged and the patient was feeling well.

Three months later the indurated area in the floor of the mouth was enlarged and a hard node in the right submandibular gland had not responded to antibiotics. Pain had returned and the patient was prescribed analgesics. The result of radiotherapy some six weeks later suggested

Fig. 3 Low power micrograph showing islands of tumour cells with peripheral palisading typical of ameloblastoma

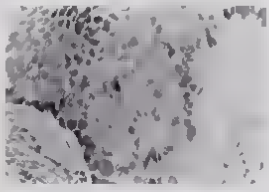

Fig. 4 High power micrograph showing dysplastic cells and keratin dispositum

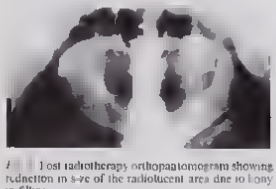

Fig. 5 Post radiotherapy orthopantomogram showing reduction in size of the radiolucent area due to bony in-filling

that the tumour had responded as consistent with Gardner's findings.[4] An orthopantomogram (*Fig. 5*) substantiates this claim. It can be seen that the radiolucency is now smaller.

The patient returned again for review some four months later at which time his mouth seemed to have settled down well following radiotherapy, however there was a retentive pit lined with normal epithelium in the lower anterior alveolar ridge.

Two months later the patient returned complaining of pain inside his lower lip. There was some ulceration present of uncertain origin (*Fig. 6*). Antibiotics were given and the patient was reviewed after one week at which stage the lesion seemed to have improved slightly.

Fig. 6 Intra-oral view of recurrence of lesion

Biopsies of the two areas were taken. Both showed hyperkeratotic epithelium overlying a small focus of recurrent tumour which was reported as "invasive ameloblastic type carcinoma".

At this stage it was felt that surgical intervention was necessary and the patient underwent full pre-operative assessment. The chest radiograph (*Fig. 7*) showed a round opacity in the lower left lobe suggestive of a secondary deposit or a possible primary. Consolidation was also present.

The area of recurrence was locally excised using cutting diathermy from the reflection of the tongue and floor of the lower lip. Thorough curettage of the bone was carried out with removal of multiple locules. Burrs were used to clean and smooth the remaining bone. The tongue was then mobilized and used to close the defect by attaching it to the lower lip (*Fig. 8*). It was felt that an intra-oral closure would cause less overall trauma than using an extra-oral flap.

Unfortunately at a follow up appointment 10 days later the wound was found to have completely broken down and the histopathology of the excision biopsy was reported as ameloblastic carcinoma. It was felt that there was little further scope for definitive treatment.

DISCUSSION

The histology describes an ameloblastic carci-

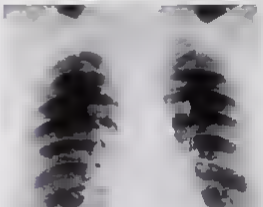

Fig 1 Pre surgery chest radiograph showing consolidation and possible metastasis in low r l f zone

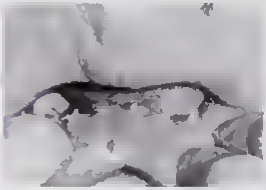

Fig 2 Post surgical intra oral view l d filled covered by tongue flap

uoma but it could also be a simultaneous occurrence of a squamous cell carcinoma Such an occurrence has been reported but only three times previously according to Nakamura *et al*[3] It could also be that there is a histogenic relationship between the two tumours with the intra-alveolar carcinoma simply representing a less differentiated form of ameloblastic carcinoma [3] This further demonstrates the difficulty of diagnosis

Corio *et al*[3] also stated that salivary gland neoplasms either metastatic invasive or arising centrally within the jaws may be mistaken for ameloblastic carcinoma Also metastatic carcinoma of the jaws from primary locations such as lung breast and the gastro-intestinal tract may mimic ameloblastic carcinoma and so must be included in the differential diagnosis

Malignant ameloblastoma has been shown in the literature[8,9,10] to have primary and metastatic foci histologically indistinguishable from typical ameloblastoma Other cases have shown histological differences with adenomatous or carcinomatous areas or simply granular cell changes [10] Increased aggressive behaviour or metastases have been associated with granular cell changes [8] amyloid deposition calcification or granular differentiation[8,12] in the primary lesion

Ameloblastic carcinoma however shows histological evidence of malignancy regardless of metastases as in this case Shear[4] listed alveolar and/or plexiform configurations of epithelium exhibiting palisading of peripheral cells occasional prickle cells nuclear pleomorphism hyperchromatism and variable mitotic activities as being characteristic of ameloblastic carcinoma but interestingly little or no keratinisation

The diagnosis therefore may be one of ameloblastic carcinoma despite the difference in radiological appearance A very similar case was reported by Dorner *et al*[3] where a tumour had been previously diagnosed as being a malignant ameloblastoma and some years later had its diagnosis changed to ameloblastic carcinoma.

The initial use of radiotherapy may seem unusual in the first instance because of the common belief that ameloblastomas are radio resistant and secondly as Lucas and Thackray[14] state that surgery is the treatment of choice However Gardner[5] reported that radio therapy can reduce the size of ameloblastomata primarily that part of the tumour which has expanded the jaw or broken into soft tissue Gardner[4] also pointed out that there is a high recurrence rate of ameloblastoma and suggested a combination of radiotherapy to reduce the size of large tumours before definitive surgical treatment was carried out

Many investigators have found the same result Deenlemeester *et al*[16] suggested surgery with a 1 cm clearance and Zachariades[17] reported a recurrence of ameloblastoma up to 36 years later after treatment and even in bone grafts

In retrospect it seems that the ameloblastic carcinoma was controlled by using radio therapy and as many investigators have found there was a recurrence within one year and surgical resection had to be undertaken

It may be inferred from this case history that

a Radiotherapy can reduce the size of ameloblastic carcinomata

b It is uncertain whether such lesions are radiocurable or why this one responded and others do not. Follow up is paramount with surgical treatment as and when necessary

c Radiotherapy is best used in inoperable cases because of the uncertainty of the outcome of as pre surgical treatment

Further study must be undertaken in this field to produce acceptable guidelines for diagnosis and also adequate radiotherapeutic data and long term follow up information. Without these reliable conclusions cannot be made

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75th Anniversary Prize

The 75th Anniversary Prize has been awarded to **Surgeon Lieutenant Commander C M Jones** for his paper *Sickle cell trait and military service* which was published in the Spring 1990 issue of the Journal

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Haematological and biochemical screening of potential Royal Naval aircrew

S C Sheard

Abstract

The objective of this study was to determine which if any of a small range of haematological and biochemical tests would be of value in detecting disease risk factors additional to the Initial Flying Medical when screening potential Royal Naval aircrew. A retrospective review of results of haematological and biochemical profiles of 200 candidates screened at the Central Air Medical Board was used. Ninety nine candidates (49·5%) were found to have profiles outside the normal range on initial testing. Many of these were found to be normal on repeat testing or further investigation. One candidate was made permanently unfit to fly and three others had certain conditions put on their training or service. It is concluded that most of the screening carried out serves only a limited function. It is recommended that screening should be stopped however should screening still be considered necessary only four tests are required: a fasting blood glucose, fasting total cholesterol and triglycerides, liver function test and full blood count.

INTRODUCTION

Medical audit is very topical at present and the recent Government White Paper[1] clearly states an intention that all doctors should be concerned with auditing. Auditing is an attempt to produce economy, efficiency and effectiveness and the responsibility for audit has been accepted by the Royal Colleges. If badly executed or used for any purpose other than to improve the quality of care it is a waste of time and resources that could be used in caring for patients. The most common reason for failure of audit is that findings do not result in improvements in day to day clinical practice.[2]

Audit is relevant to all aspects of medicine including occupational medicine. Interest in the subject is diverse as demonstrated by the Audit in Practice series published in the British Medical Journal.[3] Of particular interest to all employers including the Royal Navy is the practice of screening for fitness for work. However screening can be carried out without due consideration of its efficacy or practical feasibility. Muir and Fowler[4] recently outlined criteria that should be satisfied before screening is undertaken including the question of how the quality of the test of intervention and follow up is to be routinely audited.

The sudden incapacitation of a pilot or aircrew member is an obvious threat to flight safety. While cardiovascular disease remains the commonest cause for loss of medical certification in civilian aviation other common causes of incapacitation in civil flying are diabetes mellitus and alcohol related.[5] Incapacitation during military flying is much less common. Since 1982 all in flight incidents have been reported to the Institute of Aviation Medicine at Farnborough. Incidents of a medical nature include one case of loss of consciousness (cause unknown), one case of decompression sickness, eight of spatial disorientation, 15 related to G induced loss of consciousness and 464 episodes of fumes in the cockpit. There have also been incidents of barotrauma, abdominal and chest pain, airsickness, hyperventilation, distraction, anxiety and pressure vertigo (personal communication). There has not been a recorded case of an in flight incapacitation in Service aircraft

Surgeon Lieutenant Commander Sheard is currently appointed to HMS *Cambeltown*

resulting in an accident where the medical condition was the proven cause There have however been such incidents involving aircrew while they were on the ground The Royal Air Force, therefore followed by the Army introduced a blood screening programme in addition to the physical and associated examinations of the annual aircrew medical to try to detect individuals suffering from sub-clinical disease which might impair their performance in the air A secondary benefit of such testing is to enable the medical officer to give more informed advice during the health counselling which accompanies the annual aircrew medical This blood screening programme has been operated for over six years but no results audit or conclusions have been published

There have been a number of problems associated with this practice and some consider that many unnecessary investigations are probably undertaken For these reasons until October 1988 the Royal Navy did not do routine blood screening on its aircrew candidates except to determine blood group and to identify individuals with sickling disorders

On 1 October 1988 the Central Air Medical Board (CAMB) started blood screening for all potential aircrew at their Initial Flying Medical (IFM) It was decided to audit the data to ascertain whether routine haematological and biochemical screening was of value in detecting disease risk factors which might not be recognised elsewhere and to determine the significance of any abnormal results detected in such screening This was a CAMB initiative agreed with the Consultant Adviser in Aviation Medicine to MDG(N) Some 340 candidates are examined at CAMB each year and the data for the study was collected over an eight month period

METHOD

Candidates for IFM form two main groups

1 Civilian candidates who attend CAMB the day after passing the Admiralty Interview Board and
2 Serving members of the Royal Navy and RNR candidates who attend at appointed times

Blood is taken in the Pathology Department RNH Haslar and analysed for FBC ESR Hb electrophoresis LFTs U+E glucose cholesterol and triglycerides In addition candidates of appropriate ethnic origin are screened for G6PD deficiency All candidates are advised not to drink excessive caffeine and to avoid alcohol prior to their attendance at CAMB but are not fasted prior to blood testing. The rationale for restriction on caffeine and alcohol is that as part of the IFM blood pressure readings and EEG tracings are made To obtain optimum results the candidates need to be awake but not over-aroused Prior to this study the requirement for fasting blood tests had not been addressed

Laboratory findings are reported to CAMB where further investigation may be instigated For the purposes of this study 200 sets of blood results were reviewed The candidates were selected serially from the study start date Deviations from the normal range as defined by the laboratory were noted and any further action or investigations recorded In cases where abnormal results were recorded the candidate and his GP were informed of the fact by letter which also detailed follow up action required by CAMB These actions could be carried out either by the GP and his local hospital or at CAMB and Haslar

RESULTS

Two hundred sets of findings were scrutinised for four separate groups of individuals (*Table 1*) Ninety nine were found to be outside the laboratory reference range. In most cases only one or two of the 30+ parameters measured for

Table 1 Total numbers of tests performed and incidence of those within and outside the normal laboratory range for four groups of potential aircrew

	No of Tests Performed		
	Within normal range	Outside normal range	Total
Civilian Candidates	55	71 (57%)	126
RN Officers	33	15 (31%)	48
RN Ratings	10	13 (56%)	23
RNR Aircrew	3	0 (0%)	3
	101	99 (49 5%)	200

each individual were found to be abnormal and most of these could be described as minor since they showed only small deviations from the normal ranges However this large number of variations from the normal values (49 5%) in a group of apparently healthy young men is worthy of further consideration and can be broken down further (*Table 2*)

Hyperbilirubinaemia

Thirty nine candidates appeared to have raised bilirubin levels (normal range 2–21 nmol/l) between 26–29 nmol/l In three cases these were associated with abnormal LFTs but on repeat testing each was found to be normal Twenty nine had deviations from the normal so small (21–23 nmol/l) that they were ignored As the other seven candidates were otherwise fit and well it was assumed that they probably had hereditary abnormalities of bilirubin

The diagnosis of Gilbert's Disease is by exclusion Restrictions of calorie intake results in higher bilirubin serum levels in normal subjects and those with Gilbert's The increase in unconjugated bilirubin is significantly greater in Gilbert's disease than in normals but only when initial bilirubin is raised [6] Six cases with hyperbilirubinaemia greater than 24 nmol/l were therefore fasted for 48 hours to confirm Gilbert's Disease and showed appropriate rises in bilirubin levels the most striking being from 33 to 103 umol/l (direct 11 unconjugated 92 umol/l) as shown in *Table 3* In the seventh case fasting produced a rise in conjugated bilirubin (to 77 nmol/l) leading to a presumptive diagnosis of Dubin Johnson or Rotor's syndrome None of these sydromes affects a candidate's fitness to fly

Abnormal liver function tests

Thirteen candidates were noted to have abnormal AST levels (Three as already discussed and two with abnormal haematological parameters as well) However in all cases repeat testing showed no sustained abnormality One candidate (for Rating Aircrew) with a raised GCT 93 nmol/l (normal range up to 80 nmol/l) admitted to high alcohol intake and was made unfit to fly for one year after which he would be reviewed.

Cholesterol

Three candidates were identified with apparent hypercholesterolaemia with levels up to 8 7 mmol/l In one the APo A/Apo B ratio suggested that this was true hypercholesterolaemia He was accepted for a short service commission only with the recommendation that he be reviewed by a physician before being allowed to transfer to a pensionable commission Another individual whose cholesterol levels had returned to within the normal range after three months of dietary restrictions was accepted for aircrew training with the rider that he continue his dietary restrictions

Triglycerides

Nineteen candidates on initial screening had raised levels but on repeat testing only one

Table 2 Analysis of number of test results outside normal laboratory range against test carried out

Screening Test	No of tests results outside normal range
Bilirubin	39
LFTs (other than bilirubin)	13
Cholesterol	3
Triglycerides	19
Haematological	7
Others	26

Table 3 Detail of bilirubin levels in 6 subjects before and after a 48 hour fast (Normal laboratory range 2–21 nmol l)

Subject	Bilirubin Level (umol l) Post 48 hour fast Initial	Total	Direct	Unconj
1	48	89	6	83
2	26	38	6	32
3	33	103	11	92
4	28	38	3	35
5	24	36	6	30
6	38	54	21	33

remained abnormal After seeking medical specialist advice he was however passed for aircrew

Haematological abnormalities

There were seven candidates with abnormalities on full blood count (FBC) However only two remained abnormal on repeat testing One showed a hypochromic microcytic anaemia

Hb 12 7 MCV 63 1 MCH 20 7

Further investigation revealed a previously unrecognised beta thalassaemia trait. Although thalassaemia trait is not a bar to aircrew duties his anaemia made him unfit to fly The second candidate showed a gross iron deficiency pattern

Hb 11 7 MCV 31 4 MCH 31 4
Serum Fe 6 umol/l TIBC 81 umol/l % saturation 7%

Questioning revealed that he did not eat red meat and after further investigation to rule out other pathology a diagnosis of simple adolescent dietary anaemia was made After a course of oral iron his Hb rose to 13 4 g/gl serum Fe to 20 umol/l TIBC to 57 umol/l and % saturation to 35% He was declared fit to fly

Other

A number of other abnormalities included minor electrolyte and protein level derangements These results after scrutiny by the President of CAMB were considered to be of no clinical importance and were therefore ignored

DISCUSSION

In the last five years 25 aircrew have been declared unfit to fly on medical grounds (*Table 4*) These aviators comprised seven trained men and 18 student aircrew The data suggests that of the 25 aircrew made unfit to fly on medical grounds at most only five or so might have been identified on the basis of blood test abnormality In practice all of these could have been undetectable if the aircrew were well at the time In this series of 200 only one candidate (0 5%) was made permanently unfit to fly one temporarily so and one was restricted to a short service non-penstroable commission as the result of the new screening tests A further small number had certain restrictions made on their medical categories ie dietary or regular review but 49 5% of candidates underwent repeat and in some cases more invasive investigation for what were later deemed trivial or unimportant conditions

The cost of training aircrew is very large (between £1 25M to £3 3M depending on their role) and the loss of aircrew on any grounds is therefore a considerable expense When compared to the cost of aircrew training the cost of screening is obviously small However consideration of the low pick-up rate and limited resultant action allied with our experience of those who subsequently become unfit to fly

Table 4 Number of aircrew by status declared permanently unfit to fly on medical grounds

Medical Condition	No of Aircrew Trained	Student	Total
Fear of flying	3	2	5
Myocardial infarction	2		2
Below auditory standards	1		1
Alcoholism	1		1
Below visual standards		4	4
Eustachian Tube Dysfunction		1	1
Orthopaedic Problems		6	6
Duodenal ulceration		1	1
Ulcerative colitis		1	1
Speech defect		1	1
Epilepsy		1	1
Temperamentally unsuitable		1	1
	7	18	25

suggests that the usefulness of such untargetted screening of candidates is limited There was however considerable cost in terms in time and administration required of the staff of CAMB in preparing and answering letters to and from candidates and their GPs The requirement to re-test also had delaying effects on the decision as to a candidate s fitness to fly and therefore acceptance into the Royal Navy The delay was variable depending on the candidate his place of abode and the re-test required In most cases this delay was minimal and made little or no difference compared to a no test or satisfactory test situation In others it significantly altered the normal pattern for informing the candidate and the Admiralty Interview Board (AIB) of the results of the medical In one particular case a candidate was invited to join BRNC Dartmouth by the AIB while still under investigation without a clean bill of health[1]

In addition to these considerations the interpretation of laboratory results has been the subject of scrutiny[7] Results for an individual may be abnormal for that person but be within the reference range for the population or his normal may lie outside the normal range for the laboratory population Since the normal range for most of these tests is defined as the 95th percentile then one result in 20 is likely to be abnormal statistically with not necessarily having any clinical significance Since the subjects were having a total of 30+ parameters measured it would be surprising if each of them did not have at least one abnormal result This does not therefore indicate an abnormal profile but is an isolated abnormality which returns to normal on repeat testing.

Quality assurance has also been discussed[8] Other military services in the UK and abroad have expressed some concern about the overall cost of screening and the variability of results between laboratories (Minutes of the RAF Clinical Aviation Medical Forum)

Population screening studies have been the subject of much debate of late and they have been used for some time to screen aviators[9] and drivers.[10] However no clear guidelines or recommendations have been produced from such studies A good example of this is screening for hyperlipidaemia There can be no doubt that prevention of coronary heart disease is an appropriate aim and that the only absolute unequivocal independent atherosclerotic risk factor is an elevated serum total cholesterol [11] However recent publications[12,13,14] and a statement from the King s Fund Conference on Cholesterol (King s Fund Centre 126 Albert St London) show there is still no consensus among UK experts on the best way to screen any population

Indeed there appears to be no clear ideas as to who should be screened and how subsequent prevention should proceed [5] Management of hyperlipidaemia, when confirmed is also not clearly defined [16,17] In contrast, however, an educational and screening programme studying iron deficiency in pre school children appears more acceptable and successful [18]

In any series some apparently normal subjects will show bilirubin levels higher than the upper limit of normal When personnel suffering from haemolytic or overt liver disease have been excluded there remain those with familial hereditary abnormalities of bilirubin The commonest is Gilbert s Disease affecting some 5% of the population [19] In our series 39 (19 5%) had raised bilirubin levels (*Table 2*) This is significantly higher than one would expect A medical practitioner screening healthy candidates for the British Geographic Survey has noticed similar high numbers of raised bilirubin levels among his results (personal communication) Why should this be the case? Could it be that the reference range used is wrong for this young fit population or does the stress of the AIB and subsequent medical examination induce high levels of bilirubin? It is after all acknowledged that vigorous exercise can produce a metabolic tide which borders on the pathological

CONCLUSIONS

The implementation of blood testing was an attempt to arrive at an early diagnosis of medical conditions which might disqualify aircrew from flying duties To this end a large bank of tests for a number of undefined disease states was included in the screening process This review suggests that at best most of these tests serve only a very limited function They may even be harmful in that they can cause anxiety to the candidate and his medical officer They should therefore be stopped unless audited very carefully If it is considered a requirement to screen potential aviators this must be better tailored towards the diagnosis of the specific diseases which increase the likelihood of in-flight incapacitation The diseases in which such biochemical parameters would be useful are diabetes mellitus coronary heart disease and excessive alcohol intake In order to predict these diseases blood samples should be taken from fasted individuals for

a. Blood glucose estimation to exclude diabetes mellitus
b Total cholesterol and triglyceride levels (to include HDL cholesterol) which can then be assessed with other risk factors to predict ischaemic heart disease
c Liver function tests to identify candidates with an excessive alcohol intake
d Full blood count

There already exists a military requirement to exclude those with sickling haemoglobinopathies Therefore as two cases of anaemia have been identified a haemoglobin estimation is justified This will also be useful by providing an MCV to match with the liver function tests in the detection of excess alcohol intake Experience from the 200 candidates studied here suggests that the pick-up rate is going to be very small and so it is recommended that

1 Screening continues for a further trial using these four tests only
2 Based on the above normal reference values are produced
3 The results of the trial are audited for cost effectiveness

ACKNOWLEDGEMENTS

I wish to thank the President and staff of CAMB for their help in planning and carrying out this study and Mr Gray and the Department of Biochemistry at RNH Haslar for their advice and interpretation of data

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An orthoptist's view of St John Ophthalmic Hospital, Jerusalem before and during the Intifada

Christine M Sorsbie

INTRODUCTION

The Order of St John opened the first Ophthalmic Hospital in the Middle East in 1882 on the Bethlehem Road in Jerusalem It was so severely damaged in the fighting which followed the termination of the British mandate in 1948 that a new hospital was built in East Jerusalem and opened in 1960 (*Fig 1*) This superb 80 bed hospital has an international team of surgeons and nursing sisters as well as local Palestinian staff It also runs two fully equipped mobile units for clinical visits to outlying villages in the West Bank and Gaza Strip This "Outreach" programme, as it is called, was started in 1982 and provides treatment and care for people in areas which lack any other ophthalmic services The staff also promote eye health care and carry out screening programmes in the schools The patients attending the hospital are mainly Arabs the Israelis being provided for by their own Government resources

Five years ago in 1985 orthoptists started working at St John It had been recognised that loss of vision in a squinting eye (amblyopia) should be prevented in a part of the world already plagued with other eye problems—until then a squint was the will of Allah and only girls were brought to the hospital for cosmetic surgery in case their expectations of making a good marriage were spoilt by being cross-eyed (*Fig 2*)

Mrs Sorsbie is a Senior Orthoptist in the Eye Department Royal Naval Hospital Haslar

Fig 1 The St John Ophthalmic Hospital Jerusalem

To begin with seven of us took it in turns to visit the hospital for a period of three months each We were not expected to speak Arabic but soon found it essential to know a few words and phrases in order to communicate with the patients A nurse or member of staff would translate for us but I suspected that the lengthy discussions which sometimes took place were more often than not about their families and friends than the treatment I had advised for their eyes!

THE FIRST VISIT IN 1988—A TYPICAL DAY

The patients start to arrive outside the main gate of the hospital soon after 7 am There is no appointment system and very few will arrive with referral letters However the numbers likely to attend can be roughly estimated the

Fig 2 An 8 year old girl with a congenital left convergent squint attending for cosmetic surgery. The mother is wearing traditional dress

highest attendance being during the summer months and on Fridays the Moslem Holy Day and the lowest being in winter when it was raining. Many then find it too difficult to leave their villages down unmade roads. If the olives need picking nobody turns up unless of course it is an emergency.

As many have to travel long distances the visit to St John Ophthalmic Hospital is an excuse for a family outing: best clothes are worn the women in long embroidered dresses the traditional patterns indicating the location of their village. The men come in their djellabahs and keffiyehs although it is becoming more frequent to see them in Western dress especially if they live in one of the towns. Once registered and with their cards in their hands they settle down to wait their turn crowding onto the benches in the Outpatients Department or spreading out into the beautiful shaded inner courtyard. From a stall outside the hospital they can buy bread rounds covered with sesame seeds and while the children chew on these their parents endlessly chatter and argue, the noise infiltrating every room and cubicle in the hospital.

Our day begins at 8 am with a visit to the wards to check the post operative squint cases. Before their journey home the eye will be padded to prevent the wound being infected by flies or irritated by dust. An older relative will have accompanied the child for their stay in hospital and will often be found sleeping on the floor in preference to an unfamiliar bed.

Back downstairs, patients with squints and other children whose vision it has been too difficult to assess in the noisy and busy Outpatients Department have started to arrive in our waiting room. Assessment of visual acuity is time-consuming the children having little idea how to carry out quite simple tests eg naming pictures or pointing at letters (the Sheridan Gardiner test). This is understandable when one knows that they do not attend school until seven years of age and few have books or toys to play with at home. Many of the adults are illiterate so their vision is tested using the Landolt "C" and not the usual Snellens Chart. Taking an accurate history can also present problems. To the question 'how long has he/she had a squint' the reply might be for 40 days more associated with Biblical times than a medical report.

After completion of our investigations and tests the patient returns to the Outpatients Department for refraction and a consultant's examination. Spectacles are prescribed where necessary. These are generally disliked partly because they have to be paid for, but mainly because it is considered bad for their image—as were our old NHS glasses before the revolution of having spectacles as a 'fashion accessory'.

Occlusion treatment is advised where possible this involves patching the good eye over a period of time thus making the child use the squinting eye. The vision will however only improve if the child is young enough. In other cases arrangements are made and dates fixed for patients requiring surgery.

The clinics generally finish at 1 pm—by this time it is often very hot and we are glad to stop and have lunch which is provided by the hospital the rest of the day is then ours.

OUT AND ABOUT

The hospital is situated on the Nablus Road in an area known as Sheikh Jarrah. It is within

easy walking distance of the old city down the hill past Mr Automatic the local shop over the Wadi El Joz and into the famous American Colony Hotel for a short pause before visiting Aladdin (pronounced Al-al dim) one of the many money changers on Saladin Street Then armed with shekels you pass through the Damascus Gate to plunge into the teeming life of the souks

The old city is divided into four quarters—Moslem Christian Armenian and Jewish It is possible to walk all round the city on top of the old walls built by Suleiman the Magnificent in 1537 AD Down in the narrow streets you can barter for colourful Jerusalem pottery blue Hebron glass or carved ornaments made of olive wood Jostling amongst the tourists and pilgrims some of whom carry symbolic crosses down the Via Dolorosa you can join them at the Holy Sites or find a quiet cafe to drink mint tea and eat falafels (savoury meat rolls somewhat like a rissole which are cooked while you wait) hummus and pitta bread In the evenings from the Mount of Olives it is marvellous to watch the sun setting over the Dome of the Rock and see the old walls gradually changing colour to rosy pink.

Alternatively a short bus ride away from the Hospital you can go into Israeli West Jerusalem Here you mix with Orthodox Jews in their long black frocked coats and broad brimmed hats or the Sephardic Jews whose origins may be as diverse as Ethiopia Morocco or Northern Europe The shops in this part are new and modern and there are numerous restaurants pavement cafes cinemas and museums

At weekends providing we could get away on Fridays before the siren sounded for the start of Shabati (the Jewish Sabbath) after which no public transport would be available we could travel by bus or hired car to Tiberias on the Sea of Galilee Eilat on the Red Sea Haifa on the Mediterranean or to Jericho and the Dead Sea. Needless to say we all enjoyed these visits and our stay at the hospital

THE RETURN VISIT—AND THE CHANGES

When I returned to the hospital in July 1990 after an absence of four years to do a locum for the now permanent orthoptist, I found many changes In December of 1987 the uprising known as the Intifada started in the refugee camps of the Gaza Strip and spread rapidly to Jerusalem and the West Bank The routine of the hospital has altered considerably Strike days are frequent called by the unknown organisers of the Intifada This means that patients and staff have difficulty getting to the hospital their journeys made impossible by lack of public transport and road blocks set up by the Israeli soldiers On some days therefore the Outpatients Department can be virtually empty and on others so busy that the staff can barely cope The hospital is now trying to introduce an appointment system but there are obviously many difficulties to overcome Patients are arriving with serious eye injuries caused by rubber bullets stones and broken glass as well as more extensive injuries from the use of truncheons In 17 days I saw 532 patients approximately 25% of these were referred from Outpatients for assessment of visual acuity for conditions other than squint Besides the traumatic injuries there were many children suffering from vernal catarrh a perennial allergic condition that causes an uncomfortable inflammatory reaction of the conjunctiva, producing swollen lids and watering eyes Sadly there were still as many families to be seen where the children were partially sighted due to their parents consanguineous marriage Congenital cataracts and buphthalmos are the most common of the ophthalmic genetic disorders (with extra digits and malformation of the teeth and chest being among the other abnormalities) It was though encouraging to find that children were being brought to the Orthoptic Clinic at an earlier age for investigation and treatment of their squints Spectacles have become more acceptable and occlusion treatment more successful Surgery is still necessary for some of these cases as well as for the non accommodative types of squint (ie a squint that is not due to a refractive error) (*Fig. 3*)

I was able to go on one trip with the Outreach team—this was to Rafah on the Gaza/Egyptian border It had been arranged that one of the surgeons would carry out four cataract operations on this day Since the Intifada these trips have become unpredictable—villages can be under curfew and the driver has to negotiate check points and road blocks before entering the West Bank or the Gaza Strip Once through the yellow number plates of the minibus indicate that you are either from the Israeli sector or a foreigner—this provokes stone throwing and abuse Luckily the insignia of St John is generally quickly recognised and on this particular day we were given a warm and friendly welcome though I was advised not to go out into the town of Rafah by myself On the way

Fig. 3 A 3 year old girl whose left eye had been enucleated recently was controlled with her hypermetropia

Fig. 4 Eating an Arabic meal in the Gaza Strip

back we were invited for a magnificent meal in the home of the father of one of the male nurses. We sat on cushions on the floor and were brought huge plates of rice and chicken to eat with our fingers (*Fig. 4*).

I was not able to do so much travelling on this visit because of the increased work load and also because you had to be so much more careful where and when you went out. One morning I was forced to stay inside the old city as there had been a stabbing at the Dome of the Rock: the Israeli soldiers had closed the gates and were rounding up all the youths in the area. Another day I was in Manger Square and had to take refuge in a cafe until the soldiers had arrested some boys who were throwing stones at their jeeps. However this was nothing in comparison to the tales told at the mid-morning coffee breaks in the hospital and I consider myself fortunate to have had a relatively uneventful but extremely happy visit to Jerusalem and the St John Ophthalmic Hospital.

ACKNOWLEDGEMENTS

I would like to thank Sir Stephen Miller the Hospitaller of St John Ophthalmic Hospital for making my visit possible and to Surgeon Commander M N Jeffrey and the staff of the Eye Department Royal Naval Hospital Haslar for their help and encouragement.

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Laryngeal mask airway and tracheal tube insertion by unskilled personnel

P R F Davies, S Q M Tighe, G L Greenslade and G H Evans

(*Reprinted from* The Lancet, *Volume 336 by kind permission of the Editor*)

Abstract

After a short training programme 11 naval medical trainees inserted a laryngeal mask airway (LMA) and a tracheal tube (ETT) in random order in a total of 110 anaesthetized patients. They were allowed 40 seconds for each attempt. Success was defined as the detection of expired carbon dioxide within 40 seconds of Gaedel airway removal which subsequently rose to an end-tidal value of at least 4 kPa together with satisfactory lung expansion and ventilation without other airway intervention by the anaesthetist. One hundred and four LMA insertions were successful compared with 56 ETTs ($p<0.01$). All first attempts at LMA insertion were successful whereas satisfactory ETT placement was progressive. Insertion was also quicker with the LMA (20 seconds) than with the ETT (35 seconds) ($p<0.01$). Further studies are indicated to assess the value of the LMA in emergencies.

INTRODUCTION

There can be little doubt that tracheal intubation with a cuffed tracheal tube is the gold standard for management of the compromised airway. However time-consuming and costly training is required to obtain the skills necessary for safe and effective intubation.[1,2] Continuation training is often inadequate and skill retention tends to be poor.[3] In addition the increasing popularity of the laryngeal mask airway (LMA)[4] means that there are fewer opportunities for practising tracheal intubation.

The LMA is a recently described device for maintaining the airway in prepared patients (*Fig. 1*).[4] Anaesthetists have found it easy to insert and position correctly atraumatically.[5] It is well tolerated by patients and will facilitate later direct tracheal intubation through the lumen.[4,5] The LMA might thus be a useful device in field airway management by unskilled personnel.

The primary aim of this study was to determine whether unskilled personnel could realistically be taught to insert the LMA. We also assessed the relative ease with which the trainees learnt to insert the two airways.

METHODS

The hospital ethical committee approved the study and informed consent was obtained from the patients. Eleven Royal Naval medical trainees with no previous intubation experience or training underwent a set programme on how to insert the LMA and ETT: instruction was given through videotapes, mannikin practice and a demonstration on an anaesthetized patient. The trainees went through the trial protocol outlined below on about ten occasions during a working week. One trainee was assessed each week.

The trainees were tested on 110 ASA I (American Society of Anaesthetists category I) patients scheduled for routine elective surgery.

At the time of writing the authors were all appointed to the Anaesthetic Department, Royal Naval Hospital, Haslar.

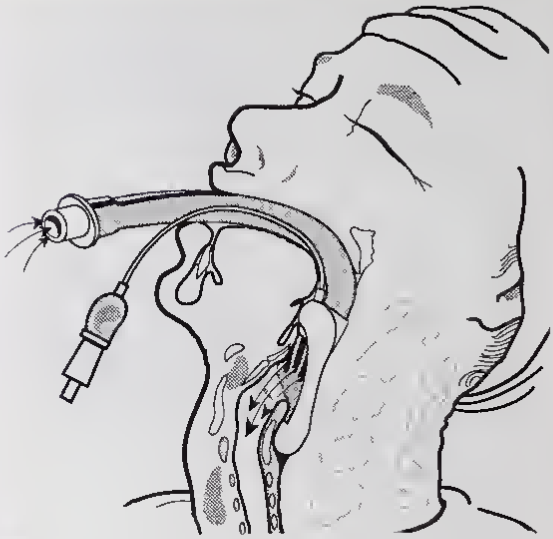

Fig. 1 Laryngeal mask airway in situ

and for whom either tracheal intubation or LMA insertion and halothane anaesthesia were entirely appropriate. Patients with loose teeth or crowns or at risk of aspiration were excluded. Premedication consisted of an appropriate dose of papaveretum and hyoscine intramuscularly 1 hour before the operation. In the anaesthetic room the electrocardiogram and finger oxygen saturation were monitored continuously. Blood pressure was measured non-invasively every 2.5 minutes. Baseline recordings were made and anaesthesia was induced with thiopentone 4 mg/kg. The depth of anaesthesia was increased with halothane in 70% nitrous oxide and oxygen. The patient breathed spontaneously with a Guedel airway in situ. When the depth of anaesthesia was judged to be adequate, 4% halothane in 100% oxygen was given for 2 minutes and the airway was handed over to the trainee.

The trainee removed the Guedel airway and immediately proceeded with the insertion of an LMA or ETT in randomised order as determined by use of random number tables. The attempt was timed from airway removal until the expiration of carbon dioxide was detected by a rapid response infra red carbon dioxide analyzer (Datex Normocap, Vickers). The anaesthetist tested for adequacy of ventilation, removed the devices and administered 100%

Table 1 Results of endotracheal tube (ETT) and laryngeal mask (LMA) insertions

Trainee	ETT+ LMA+	ETT+ LMA−	ETT− LMA+	ETT− LMA−	% success ETT	% success LMA
1	5	0	5	0	50	100
2	6	0	3	1	60	90
3	3	1	6	0	40	90
4	3	0	8	0	27	100
5	6	0	3	1	60	90
6	4	0	5	1	40	90
7	7	0	2	0	78	100
8	6	0	4	0	60	100
9	2	0	8	0	20	100
10	6	0	2	2	60	80
11	7	0	2	1	70	90
Totals	55	1	48	6		
Mean					51*	94

ETT+ =success with ETT ETT− =failure with ETT
LMA+ =success with LMA LMA− =failure with LMA
* $p<0.01$ compared with ETT McNemar's test

oxygen and 4% halothane for 2 minutes. The airway was then again transferred to the trainee who inserted the remaining device. The anaesthetist timed the attempt, confirmed the position of the device as before and then continued anaesthesia with nitrous oxide, oxygen and halothane.

Success was defined as the production of carbon dioxide within 40 seconds of airway removal which subsequently rose to an end tidal value of at least 4.0 kPa together with satisfactory lung expansion and ventilation without other airway intervention by the anaesthetist. Intervention was required if the procedure took more than 40 seconds, if the oxygen saturation fell below 95%, if trauma was imminent or apparent or at the anaesthetist's discretion.

To prevent trauma to the patient and to provide realistic training, the trainee received verbal instruction throughout his attempt at intubation. If the attempt was unsuccessful, errors were identified and the correct manoeuvre was demonstrated.

Results were analyzed by McNemar's test for success rates summing 'T' for each trainee and by Wilcoxon's matched pairs test for average insertion times with 41 seconds being allocated for each failure.

RESULTS

One hundred and ten attempts at LMA and ETT insertions were made. Nine trainees had ten patients to intubate, one had nine and one had 11. Trainees had more success with the LMA (103/110) than with the ETT (56/110) (*Table 1*). Other causes of failure with the ETT included oesophageal placement (14/54 failures), infliction of trauma (2/54) and long insertion time (38/54). The LMA caused partial obstruction on three occasions and was removed. The other LMA failures were due to time expiry.

All first attempts at LMA insertion were successful compared with 82% of second attempts and above 90% subsequently. Success rate was 94% overall (*Fig. 2*). With the ETT success was progressive being 0% with the first patient, 80% with the tenth and 51% overall.

Insertion times were compared whether the attempt was successful or not with a time of 41 seconds being allocated to failures. The mean insertion times were 20 seconds for LMA and 35 seconds for ETT ($p<0.01$) (*Table 2*).

DISCUSSION

Our study showed that unskilled personnel can be taught to insert the LMA. One week's

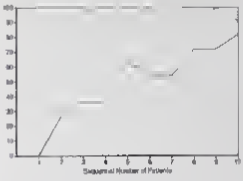

Fig 2 The percentage of trainees successful at inserting a tracheal tube (——) or a laryngeal airway (– – –) into each of ten patients in sequence

Table 2 Average insertion times (seconds) for endotracheal tube (ETT) or laryngeal mask (LMA)

Trainee	ETT	LMA
1	37	12
2	35	17
3	38	27
4	36	18
5	34	22
6	38	23
7	29	20
8	32	18
9	39	18
10	33	27
11	34	21
Mean	34	20*

*$p<0.01$ compared with ETT Wilcoxon's matched pairs test

training with ten attempts at inserting the LMA will suffice whereas for the ETT these figures would probably have to be doubled. The extended training course of ambulance staff specifies 25 tracheal intubations and a 2 week theatre attachment preceded by several months of classroom instruction.[3]

The trainees' overall success rate of 94% with the LMA compares favourably with the 98% rate reported by anaesthetists[1] which suggests that medical expertise does not substantially improve results. In the anaesthetists' trial 10% of the LMAs were rested because of airway obstruction and were then regarded as successes. Three LMAs were removed in this study but were not replaced. The lower incidence of obstruction in our study may have been related to our use of a later model of the LMA which does not require an introducer. Any training programme in LMA use must include recognition of the signs of airway obstruction.

Trainees insert an LMA more quickly than an ETT. Although preparation time (for lubrication, cuff testing and cutting to length) for the two devices was not assessed it is thought to be similar so that earlier ventilation and oxygenation of the patient should be accomplished with the LMA. The constantly high success rate achieved for LMA suggests that continuation training will not need to be frequent or extensive but this supposition needs confirmation.

The most serious disadvantage of the LMA is the possible aspiration of gastric contents which is currently a contraindication to its use in emergencies. A cuffed ETT protects the airway and must remain the instrument of choice. However when intubation is indicated but impossible because the rescuer does not have the adequate skills or because of anatomical difficulties in the patient the only realistic alternatives are a face mask with pharyngeal airway or cricothyroidotomy. It is difficult to supply high inspired oxygen concentrations with a bag and mask which requires two operators for maximum ventilation[10] but such concentrations could be achieved by a single operator using the LMA. Most British ambulances carry only one attendant during transit.

The bag and mask confers no airway protection but the LMA may provide some protection against gastric aspiration.[1] The LMA has been associated with aspiration[1] but no serious consequences have been reported. The lateral position, suction and cricoid pressure could still be applied should regurgitation occur.

Although the trachea can be intubated blindly through the lumen of the LMA[1,9] this may not be feasible for unskilled personnel.

We conclude that the LMA may have a place in emergency airway management but further controlled studies should be conducted to establish

a. the advantage or otherwise of the LMA over bag-and-mask techniques
b. the risk of aspiration with the LMA
c. skill retention and
d. the value of the LMA in full cardiopulmonary resuscitation

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Queen Alexandra's Royal Naval Nursing Service

Kathleen Harland MA

This book was commissioned to be written by Kathleen Harland for the QARNNS Centenary celebrations in 1984 The high cost of publish ing and corresponding lack of finds put the project into abeyance until it was brought to the attention of the Editorial Committee of the Journal of the Royal Naval Medical Service Only through the financial backing of the JRNMS who have acted as publishers has it been possible to print the book

Mrs Harland has written a comprehensive account of the History of QARNNS from their inception in 1884 up until 1986 It is a book which combines history general interest and some anecdotes in an easy to read style She relates the initial antipathy to females being attached to the Royal Navy the conditions under which some QARNNS Officers served in WW2 and describes the trials of service during the Korean War and latterly the effect of the Falklands War The book will be of interest to historians in particular the comprehensive tables at the back of the book which cover a diversity of subjects including Honours and Awards and Establishments where QARNNS Officers have served A wide selection of photographs provide contrast and further interest for those people who may prefer just to browse through the pages

The book costs £8 50 which includes postage For those who can collect direct from the Office of Surgeon Commodore (NMT) the cost will be £7 50 To order a copy of the book you are requested to complete the form below and send to ISTO Office of Surgeon Commodore (NMT), Monekton House Institute of Naval Medicine Alverstoke Gosport Hants PO12 2DL

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Medical Support Assistants: Early experience in training

W M Luke

Abstract

The paper provides a background to the format on of the Medical Support Assistant branch of the Royal Navel Reserve. The objectives of training and the war role are stated. Detailed particulars of each year of training together with personal experience are given. Comments about the future status of the branch and exercising are made.

INTRODUCTION

The Medical Support Assistant (MSA) branch of the Royal Naval Reserve (RNR) was formed in Autumn 1987 the role being to assist in the care of casualties on the sea leg of the evacuation route from mainland Europe. There is no precise equivalent in the Royal Navy. This paper describes early experience in the training of MSAs.

BACKGROUND

In the event of conventional war in Western Europe it is considered that there will be a very large number of front line casualties. The land/sea route is one of the options existing for the repatriation of casualties to Britain. Casualty evacuation will require the use of ships taken up from trade (STUFT) and Roll on/Roll off car ferries (RO ROs) are ideal with their wide open spaces for casualty care. The RO ROs will have an ambulance not a hospital function. (The use of RO ROs in a hospital function was exercised recently at Staghton Camp.) The casualty evacuation chain is shown in *Fig 1*.

The RNR Medical Service (including dentists and QARNNS(R)) will provide the medical and nursing care on the RO ROs. The requirement for a very large number of trained paramedics with experience of working at sea prompted the formation of the MSA branch. In conjunction with CINCNAVHOME the Royal Naval Medical Staff School (RNMSS) Training Design Team designed a course with commendable speed to meet the requirements of the MSA war role. The statement of objectives for MSAs is shown in *Fig 2*.

PREVIOUS EXPERIENCE OF TRAINING IN THE RNR MEDICAL BRANCH

Medical Assistants (MAs) in the RNR are generally speaking ex RN. There are three Medical Technicians (MTs) in the RNR, all ex RN and one of these is serving with the Royal Marines Reserve (RMR). RNR trained MAs exist in small numbers because the 44 week full time training course cannot readily be broken down into a suitable package for a List 3 RNR rating. It is greatly to the credit of some units that RNR MAs have been trained at all. A new approach was therefore needed and pilot schemes for MSA training were set up at five centres:

HMS *Cleverhouse*/HMS *Scotia* (shared training)
HMS *Flying Fox*
HMS *Forward*/HMS *Mercia* (shared training)
HMS *Graham*
HMS *Sherwood*

I had recently transferred from HMS *Cleverhouse* to HMS *Scotia*. The sick bay in HMS *Scotia* was a single room and I had no medical or nursing complement. The enthusiastic assis

Surgeon Lieutenant Commander Luke RNR is Sea or Medical Officer to HMS *Scotia*

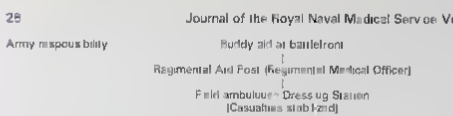

Fig 1 Casualty evacuation chain from front line to UK port for dispersal

Operational objective

1 Provide a basic level of First Aid life support measures
2 Assist in the management of surgical, medical and psychiatric patients for a limited period in a non hospital situation
3 Undertake the administrative procedures and documentation for patients on casualty evacuation flights
4 Exercise the general Naval and military skills required of a Medical Support Assistant employed in the casualty evacuation role

Fig 2 Statement of objectives for Medical Support Assistants

lance of a Biology teacher Commanding Officer was invaluable in the early stages. A doctor, a nursing sister and one L/RGN were quickly recruited and I was fortunate to be given a small building in which to establish a Medical Centre (*Fig 3*). It rapidly became apparent that Drill Night training could not be shared between Divisions and sharing of training with HMS *Cleverhouse* has been minimal and only at weekends.

A spell of buoyant recruiting and a reservoir of well motivated redundant Communications ratings gave the MSA branch an excellent start. In September 1990, three years after introduction and after 30 months of training, there are approximately 189 MSAs nationwide (in 23 out of the 28 RNR Divisions).

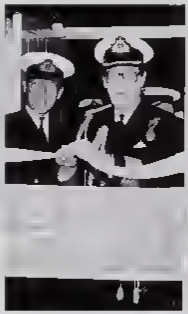

Fig 3 Surgeon Captain R J Berry RD RNR performing the opening of the Medical Centre HMS Scotia, 7 September 1989 with Surgeon Lieutenant W M Luke RNR.

TRAINING SCHEDULES

The schedule for the three years of MSA training is shown in *Fig 4*. Medical teams allocated to ships will comprise any combination of MSA/Enrolled Nurse (EN) male or female according to availability. A high standard is therefore expected from MSA training and the course is varied and comprehensive.

First year module

An immediate problem was posed for our Communications transferees in that they had already completed all their New Entry training and had attended HMS *Raleigh*. Stop gap

Year	Module		Type	Location	Duration	Attendances	Notes
1	a	Unit New Entry Training	Theory/Practical	In unit	8–12 weeks	12	Entry as FMSA
	b	Naval General Training	Theory/Practical	HMS Raleigh	2 weeks	—	
	c	First Aid (including anatomy/physiology)	Theory/Practical	In unit	1 year	28	
	d	First Aid	Practical	Own or other unit	1 weekend	8	
	e	First Aid	Revision	In unit	—	2	Advancement to AMSA
2	a	Nursing Skills	Theory/Practical	In unit	1 year	18	
	b	Administration	Theory	In unit	—	4	
	c	First Aid	OJT	RNMSS	2 weeks		Validation of Year 1 First Aid Module by RNMSS
		Nursing Skills	Theory/OJT	RNMSS	Continuous		
		Administration	OJT	RNMSS	Training		
		Naval General Training	Theory/Practical	RNMSS			
	d	Nursing skills	OJT	Hospital ward	7 days	28	Task Book
3	a	Nursing skills	OJT	Hospital Ward	7–14 days	28–56	Completion of Task Book—Advancement to MSA
	b	Naval General Training	Theory/Practical	In unit	1 year	22	
	e	All Modules	Continuous	RNMSS	2 weeks	—	Continuation of In Unit training

Communication transfers had already completed Modules a and b of Year 1

The syllabus for the RNR MSA is to be completed over a three year period. In order to claim bounty the RNR rating on List 3 is required to have attended 50 drill nights of two hours duration. Where week end training or ward training is noted the equivalent in attendances is also included

Fig. 4 Three-year MSA training schedule

training particularly to cover the obligatory annual two weeks of continuous training was necessary Surgeon Commander D J Rose RN arranged an interesting fortnight during which the MSAs visited a variety of medical survival and escape training facilities in the Portsmouth area

The MSA component of the first year posed different problems The level of anatomy and physiology had been agreed between Staff Medical Officer (Reserves) (SMO(R)) to CINC NAVHOME (CNH) and Principal Medical Officer (Reserves) (PMO(R)) The depth of study of these subjects stretched my trainees whereas at least one other source has suggested that his trainees were bored and that retention suffered! I believe that the anatomy and physiology modules can be modified for the future

Examination papers are set, marked and moderated by CNH Four papers (two written and two practical) are taken by each candidate The pass rate for six candidates in 1989 was 23 out of 24 papers which was most encouraging

The Medical Department is in an enviable position for recruiting as candidates pass through for examination First impressions must therefore be favourable! However we encountered difficulties from having three or four intakes through the first year and a certain amount of duplication of teaching was inevitable The development of self-help tutorials has been invaluable in ensuring full coverage of the syllabus Interdivisional weekend training has been extremely useful and our Medical Centre (complete with kitchen facilities) is ideal for the purpose Shared weekend instruction has been of especial help to neighbouring units with training problems.

Our retention rate of over 70% (after two years of training) is I believe reasonable HMS *Scotia* is a Headquarters Unit, but training and retention has apparently not been so easy in Sea Training Centres (STCs)

Second year module

In unit training for the second year occupies only 22 drill nights and this does reduce the overall demand on instruction time which is important when a division has started a second course of 1st year MSAs Nevertheless a willingness to repeat elements of the course and the encouragement of note sharing and revision periods is as always important in ensuring full coverage Outside assistance is always of value and we are indebted to the staff of RNSQ HMS *Cochrane*

The second year course is mainly on job training (OJT) and of necessity has to be carried out in NHS hospitals The willingness of NHS hospitals to assist in training is variable across the country The Dunfermline and West Fife Hospital has been most helpful in our case The training has been of a high standard involving personal tuition by senior staff as well as some practical experience The Ministry of Defence provides Crown indemnity for RNR personnel on duty but arrangements with NHS hospitals must be formally agreed The use of a number of different hospitals for MSA training is worth considering particularly if a ratng has a hospital near to home Attendance by ratings two at a time has seemed to be right for maximum experience This training does detach MSAs from their divisions however and it is important to maintain contact throughout

The two week period of continuous training at RNMSS should be preceded by the 16 week clinical and administrative module but early courses had not allowed time for this It makes the training more worthwhile for the ratings if they have had ward experience first

Two out of five of HMS *Scotia's* first batch of RNMSS trainees passed their course while a further two failed in Service Administration only

Third year module

The third year module has a balance between OJT and in unit training similar to the second year At present there is no further experience or knowledge of the third year course It is clear however that courses will have to run concurrently and that Units with all three years of MSAs under training will be tasked with providing 82 evenings of instruction a year

GENERAL TRAINING AND EXERCISES

The need to provide variety in training was appreciated at an early stage While the majority of academic training has been accomplished on Drill Nights weekend and continuous training has provided experience of a different nature A survival week on the Isle of Lunga in the Hebrides tested ability to manage without provisions! Abseiling and other outdoor pursuits and night time exercises have broadened horizons In every case the opportunity has been taken to practice casualty handling

The need to exercise the war role is well appreciated The most recent experience of Ambulance ships in the Falklands war differed

in two main ways namely that they were designated as non combatant and therefore protected and that they did not have to provide for nuclear biological and chemical defence (NBCD) RO ROs in any European conflict are unlikely to have any protection under the Geneva Convention and may be subject to NBC attack

The Royal Army Medical Corps (RAMC) camp at Saighton near Chester is well equipped for RNR training purposes There are good classrooms and field facilities A major accident scenario allows the practice of casualty handling after road accidents and plane crashes There is a gas chamber The RAMC have a field hospital complex which can be adapted for RO RO simulation A two week camp at Saighton in May 1990 run by the RNR for the RNR but also involving the Regular Army was a great success

Triage and evacuation of casualties from a Danish warship was practised in Exercise Sharp Spear/Joint Venture This exercise was noteworthy for involving the RAMC(TA) and voluntary services (eg Red Cross) NHS ambulance and hospital facilities would also have been exercised had it not been for national industrial action Another similar exercise has been held The need for realistic training and exercising is vital I believe it can best be achieved by the joint endeavours of the RNR medical branch and the RAMC

THE FUTURE

Political events have changed in a way that had not been anticipated in 1987 The whole direction of our defence policy is under close scrutiny I believe though that MSAs will continue to have an important role to play and their future status in the traditional RNR structure must take account of their achievements and aspirations

The greatest problem facing RNR units where MSAs have been recruited is retention Vigorous and innovative leadership by the senior medical and nursing staff will be essential if we are to maintain their interest and motivation and all avenues in which practical on-job training and esprit de corps can be enhanced must be vigorously pursued

Continued support from RNMS staff at all levels is essential in order that the RNR medical branch may develop

POSTSCRIPT

Experience over the past two years has confirmed that the original three year course is too long. A review of the syllabus to reduce training time is well advanced

Notice

NETLEY MILITARY ASYLUM 1870–1978

We have had a request for information on the history of Netley Military Asylum (Victoria House) which was built originally as a mental hospital for the army but became the main psychiatric unit for the Royal Navy from the 1950s until it closed in 1978.

Anyone who worked there or can furnish any information about Victoria House is requested to contact.

Mr F W Kirkby
7 Sutton Gardens
St Peters Street
Winchester
Hants SO23 8HR

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Management of gastrointestinal haemorrhage

R J Leicester

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INTRODUCTION

Haemorrhage is a common feature of gastrointestinal disease it presents either as an acute life threatening emergency or as anaemia with chronic blood loss If morbidity and mortality are to be minimized diagnosis and management require a coordinated approach by physicians surgeons and radiologists

ACUTE UPPER GASTROINTESTINAL HAEMORRHAGE

Haemorrhage from the upper gastrointestinal tract is a common cause of emergency admission to hospital the overall mortality is 10% rising in elderly patients

Causes (*Fig 1*)

The most common cause of upper gastrointestinal haemorrhage is peptic ulcer disease Duodenal ulcers are more common in younger patients gastric ulcers and erosions occur more commonly in the elderly Bleeding from oesophageal varices in patients with chronic liver disease and portal hypertension accounts for only 10% of cases and it should be noted that in 20% of patients with known varices the cause of bleeding is another lesion (eg peptic ulcer)

	Percentage
Duodenal ulcer	30
Gastric erosions	15
Gastric ulcer	15
Miscellaneous causes (eg benign and malignant tumours oesophagitis vascular malformations)	12
Oesophageal varices	10
Mallory Weiss tear	8
Undiagnosed cause	10

Fig. 1 Causes of upper gastrointestinal haemorrhage.

The association of non steroidal anti inflammatory drugs (NSAIDs) with gastrointestinal bleeding is unclear Although gastric erosions and ulcers are known to occur during therapy the association may simply reflect the high proportion of elderly patients using these drugs for arthritis who are also in the high risk group for peptic ulceration Nevertheless 50% of patients over the age of 60 years presenting with haematemesis or melaena have a history of NSAID ingestion Steroid therapy is often quoted as a cause of gastrointestinal haemorrhage due to the classical Cushing's ulcer but the association is unclear and the lesion is rare Poorly controlled anticoagulant therapy may cause severe haemorrhage from relatively minor mucosal lesions or pre-existing upper gastrointestinal lesions for example peptic ulcer or carcinoma

Stress ulceration associated with overwhelm

Surgeon Commander Leicester is Professor of Naval Surgery and is currently appointed to Royal Naval Hospital Haslar

ing sepsis or severe burns is fortunately uncommon since the advent of intensive monitoring and adequate resuscitation in modern intensive care units (ICUs). However when stress ulceration does occur it is usually severe and associated with a high mortality.

Mallory Weiss tears are a common diagnosis in young patients particularly after excessive alcohol ingestion and subsequent vomiting. The lesions are usually mild and self limiting but, occasionally they can be associated with severe haemorrhage.

History

Patients who have acute upper gastrointestinal haemorrhage usually present with a history of haematemesis or melaena. Haematemesis is more common with lesions in the oesophagus or stomach and melaena is more common in lesions distal to the pylorus. If however bleeding is profuse dark red rectal bleeding may be the presenting feature. Signs of significant active loss are pallor clammy skin tachycardia and hypotension. A past history of dyspepsia, alcoholism, NSAID ingestion or weight loss may suggest the causative lesion.

Management

Initial management

All patients suspected of having a significant gastrointestinal bleed should be admitted to hospital for assessment. A systolic blood pressure of less than 100 mm Hg or a tachycardia of greater than 100 beats/minute suggests significant blood loss of at least 20% of the circulating volume and the patient should be admitted to an ICU for resuscitation and monitoring.

Hypovolaemia should be corrected with plasma expanders followed by blood transfusion to stabilize the patient prior to definitive investigation. Central venous pressure measurement or monitoring using a Swan-Ganz catheter helps prevent over transfusion in elderly patients and is a sensitive indicator of continued or recurrent bleeding.

Blood samples should be taken for haemoglobin estimation clotting screen, urea and electrolytes. Haemoglobin level is however a poor indicator of the degree of blood loss in the early stages as haemodilution takes several hours to develop. A patient with a low haemoglobin has probably bled slowly and in elderly patients, the speed of transfusion must be controlled carefully. In these patients a high plasma urea in the presence of a normal creatinine is a more useful indication of the quantity of blood loss.

Endoscopy

Upper gastrointestinal endoscopy should be carried out as soon as the patient's condition is stable. Superficial mucosal lesions can be diagnosed more accurately by endoscopy than by barium meal examination. Endoscopy has the advantage that it can

* assess the rate of haemorrhage and stigmas of recent bleeding which includes a visible vessel in the ulcer base a spurting or oozing blood vessel and the presence of fresh blood clot
* identify patients for whom surgery is unsuitable (eg those with gastric erosions or oesophageal varices)
* identify the bleeding site thus facilitating the planning of the surgical approach
* facilitate the use of therapeutic haemostatic procedures

Endoscopy should be performed with the patient under minimum sedation with intravenous benzodiazepine (eg diazepam 5 mg or midazolam 2.5 mg) by an experienced endoscopist using a gastroscope with a wide bore suction channel. Iced water lavage may help to identify the bleeding site.

Endoscopic haemostasis with laser diathermy or heater probe and injection of 1:10 000 adrenaline possibly combined with a sclerosant has shown some promise. The use of clips or staples placed endoscopically requires further evaluation.

Further Management

Depends on the response to resuscitation and the causative lesion. Patients should take nil by mouth for 24 hours then providing there is no evidence of rebleeding oral intake may be resumed. If the patient remains stable over the next 48 hours conservative therapy can be continued. Management of bleeding peptic ulcers and oesophageal varices is considered in further detail below.

Gastric or duodenal erosions should be treated with intravenous H_2 receptor antagonists (eg cimetidine 400 mg 6 hourly or ranitidine 50 mg 4-hourly). The value of iced water lavage is unproven but it may help in severe cases. If there are only a few acute lesions it may be possible to stop bleeding by endoscopic methods as described above. If bleeding persists surgery with total gastrec-

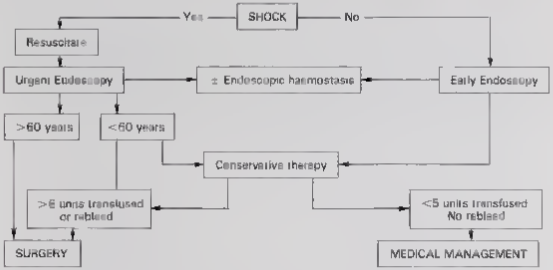

Fig. 2 Management of acute haemorrhage from peptic ulceration

tomy is indicated, though it has an extremely high mortality Mallory-Weiss tears commonly resolve spontaneously but in severe cases local injection of adrenaline at endoscopy may help On the rare occasion when a patient bleeds persistently a surgical approach and direct suture may be required Oesophagitis should be treated with H_2-receptor antagonists or in severe cases omeprazole Benign or malignant tumours may respond to initial endoscopic haemostasis prior to elective surgery Vascular malformations are commonly amenable to endoscopic haemostatic methods

Peptic ulcer (*Fig. 2*)

In theory patients who have a bleeding chronic ulcer should benefit from a reduction in gastric secretion There is however no conclusive evidence that use of H_2-receptor antagonists or somatostatin reduces the incidence of rebleeding Nevertheless the aim is to produce ulcer healing and the patient should be started on a course of ulcer healing agents such as an H_2 receptor antagonist

Surgery

70–80% of patients who are bleeding from chronic peptic ulcer spontaneously stop bleeding and respond to conservative measures However patients who require surgery especially the elderly suffer less morbidity and mortality if surgery is carried out within the first 24 hours of hospital admission It is therefore important to recognise the indications for surgery which are

* continued bleeding
* recurrence of bleeding
* patients over 60 years of age with a significant bleed causing shock.

If the ulcer has not been located at endoscopy at operation a gastrotomy should be performed initially Duodenal ulcers should be treated by truncal vagotomy pyloroplasty and under sewing of the bleeding ulcer In experienced hands under-sewing combined with highly selective vagotomy has produced good results but the operation is lengthy in a patient who is often at high risk. If the ulcer is large and closure of the pyloroplasty is compromised Polya gastrectomy with drainage of the duodenal stump should be performed The operation of choice for a bleeding gastric ulcer is Billroth I gastrectomy though for ulcers which are located high on the lesser curve excision of the ulcer combined with either truncal vagotomy and pyloroplasty or highly selective vagotomy is acceptable.

Oesophageal varices (*Fig. 3*)

If bleeding from oesophageal varices is not adequately controlled it has a high morbidity

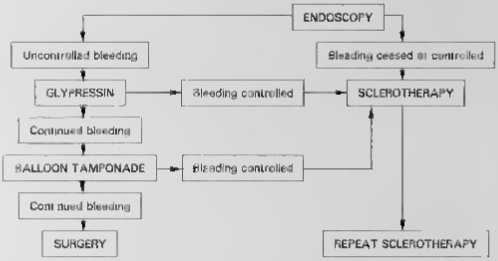

Fig 3 Management of acute variceal haemorrhage

and mortality and though bleeding ceases in 70% of cases rebleeding is common

Injection sclerotherapy is the initial treatment of choice intravariceal or paravariceal injection of sclerosant using 5% ethanolamine oleate or 1% polidocanol is performed (Intravariceal injection is probably more effective and reduces the risk of oesophageal ulceration or stricture) Injection therapy should be repeated at 1–3 weekly intervals until the varices have been obliterated

In patients where bleeding cannot be controlled by sclerotherapy management should involve either passage of a Blakemore-Sengstaken tube for 12–24 hours or the use of vasoconstrictors (glypressin or vasopressin) Passage of a Blakemore-Scogstaken tube is unpleasant for the patient, and glypressin 1–2 mg iv 4-hourly combined with nitroglycerin 10 mg as a continuous infusion over 4 hours to lessen the cardiac effects should be used initially balloon tamponade should be reserved for patients who continue to bleed Where balloon tamponade is employed inflation of the gastric balloon alone with gentle traction to maintain its position at the fundus reduces the risk of aspiration The position of the balloon should be checked radiologically Following control by either of these methods sclerotherapy should be performed

The patients (5–10%) who continue to bleed after these measures have been taken have severe decompensated cirrhosis and surgery despite its high morbidity and mortality may be life saving As there is a high incidence of encephalopathy shunt procedures are seldom employed the procedure of choice is oesophageal transection preferably combined with gastric devascularization (Sugiura procedure) If this procedure is successful, it has a low rate of rebleeding

ACUTE LOWER GASTROINTESTINAL BLEEDING

Rectal bleeding is a common symptom of colorectal disease but bleeding from the small intestine may also present in this manner Spontaneous resolution may be expected in a high proportion of cases though morbidity and mortality can be high particularly in the elderly Aggressive resuscitation and early accurate investigation should be pursued

Causes (*Fig 4*)

The most common causes of lower gastrointestinal bleeding are minor anorectal conditions such as anal fissure or haemorrhoids These conditions seldom cause major acute blood loss, though they should be excluded as a source of bleeding in all cases Other causes of bleeding should be considered according to age group

* In children the most common conditions are Meckel's diverticulum juvenile hamartomatous polyps and inflammatory bowel disease
* Young adults are more likely to be suffer-

Anorectal conditions
Haemorrhoids
Anal fissure
Solitary rectal ulcer

Children
Meckel's diverticulum
Juvenile polyps
Inflammatory bowel disease

Adults
Inflammatory bowel disease
Adenomatous polyps
Carcinoma
Arteriovenous malformation

Elderly
Diverticular disease
Angiodysplasia
Adenomatous polyps
Carcinoma
Ischaemic colitis
Inflammatory bowel disease

Fig 4 Causes of lower gastrointestinal haemorrhage

ing from inflammatory bowel disease adenomatous polyps or arteriovenous malformations

* In the elderly diverticular disease carcinoma angiodysplasia or ischaemic colitis are the most common causes

Massive blood loss from an upper gastrointestinal lesion may also present as rectal bleeding Drug therapy may cause bleeding (usually occult) terminal ileal ulceration is being seen increasingly with the use of NSAIDS and poorly controlled anticoagulant therapy may cause significant bleeding from malignancies and minor mucosal lesions

History

Patients usually present with either bright red rectal bleeding (signifying a distal lesion) or dark red rectal bleeding which may be mixed with mucus if an inflammatory or neoplastic lesion is present

* A past history of abdominal pain and alteration of bowel habit may indicate a neoplastic lesion
* Diarrhoea may indicate an inflammatory process
* Recent overseas travel in areas where amoebic or schistosomal infection are common suggests an infective cause
* Past radiotherapy for genitourinary malignancy even many years before can cause radiation colitis
* Elderly patients with cardiovascular disease may have ischaemic colitis or angiodysplasia
* Ischaemic colitis is a likely cause following aortic aneurysm surgery

After adequate resuscitation definitive investigation can be planned

Management (*Fig 5*)

Initial management

In patients who have acute lower gastrointestinal haemorrhage urgent resuscitation is essential (see above)

Resuscitation
History
Digital anorectal examination
Proctosigmoidoscopy
Haematological and clotting screen
Biochemical screen
Upper gastrointestinal endoscopy
Colonoscopy
Mesenteric angiography
Radionuclide scintiscanning
Laparotomy plus intraoperative colonoscopy

Fig 5 Diagnosis and management of acute lower gastrointestinal haemorrhage.

Diagnostic investigations

Digital anorectal examination and proctosigmoidoscopy should be carried out to exclude local anorectal conditions A uniformly inflammed friable rectal mucosa indicates colitis, and rectal biopsy plus stool microscopy and culture and amoebic fluorescent antibody titres should be performed If a local cause is not found an upper gastrointestinal endoscopy is carried out to exclude a cause in the upper gastrointestinal tract

Colonoscopy is performed if bleeding has stopped Blood has a cathartic effect and following oral purgation a good view is usually obtained In the presence of bleeding though small lesions may be overlooked valuable clues may be obtained about the segment of bowel from which the haemorrhage is arising Colonoscopy also allows therapeutic procedures to be carried out (eg snare polypectomy diathermy coagulation of bleeding tumours and arteriovenous malformations or angiodysplasia) Colonoscopy should be performed under only intravenous sedation except where a laparotomy is indicated for surgical approach to haemostasis In these circumstances colono

scopy under general anaesthetic is permissible with the peritoneal cavity exposed and following on table lavage with saline or water introduced via a Foley catheter through a caecostomy

Mesenteric angiography—when endoscopy fails to identify a lesion or bleeding continues at such a rate that surgery is inevitable and providing radiographic expertise is available, mesenteric angiography can be used to identify the site of bleeding in up to 80% of cases Catheterization of superior and inferior mesenteric arteries should be carried out, followed by coeliac axis angiography to exclude bleeding from aberrant middle colic vessels

Radionuclide techniques—if the rate of bleeding is slow angiography is unlikely to be successful and radionuclide techniques should be employed

Technetium 99m sodium pertechnetate has been used traditionally to identify bleeding from Meckel s diverticulum Localization however may be poor Scanning with ^{99m}Tc labelled RBCs takes longer to prepare but is more accurate Small bowel enema may also be useful in identifying Meckel s diverticulum

Surgery as a diagnostic procedure is notoriously inaccurate as there is a large quantity of blood in the lumen spread over a significant length of the bowel However when there is massive haemorrhage in a deteriorating patient it is occasionally necessary to proceed to emergency laparotomy this should be combined with on table colonoscopy In centres where expert angiography is unavailable intraoperative colonoscopy is the investigation of choice Depending on the lesion endoscopic therapy or resection may subsequently be performed If neither colonoscopy nor angiography is available subtotal colectomy with ileorectal anastomosis results in the lowest morbidity and mortality Re-operation is often required following segmental resection performed blindly

Further management

In 80% of cases bleeding from lower gastrointestinal causes usually resolves spontaneously this allows definitive treatment of the cause as an early procedure Haemorrhoids may be treated by injection rubber band ligation or infra red coagulation surgery is reserved for large third degree lesions.

Acute ulcerative colitis should be treated with high dose steroid therapy (prednisolone 40 mg/day po or hydrocortisone 100 mg iv 6 hourly) plus sulphasalazine 1–2 po 6 hourly or 5 aminosalicylic acid 500 mg 8 hourly combined with local steroid enemas particularly if the disease is distal If however bleeding is not rapidly controlled colectomy may be necessary Acute bleeding is less common in Crohn's disease and is managed in a similar manner Bleeding from radiation colitis may be difficult to control but often responds to steroid enemas only severe cases require resection Ischaemic colitis is usually self limiting, but may result in subsequent stricture formation Infective colitis should be treated using appropriate antibiotics (eg metronidazole in amoebic infections)

Adenomatous polyps may be removed by snare polypectomy and cancers and Meckel's diverticulum can be treated by appropriate resection Small bowel ulceration resulting from NSAID therapy is usually self limiting, but severe cases may require laparotomy and resection

Arteriovenous malformations (eg telangiectases or angiodysplasia) may be treated by colonoscopic diathermy coagulation though excessive lesions particularly those in the right colon are best treated by surgical resection

OCCULT GASTROINTESTINAL BLEEDING

Chronic blood loss from gastrointestinal tract often presents as iron deficiency anaemia In men and in post menopausal women it is probably the most common site for blood loss However before instituting a series of costly invasive investigations in what is usually an elderly population it is important to ascertain that the anaemia is iron deficient and that the deficiency is the result of blood loss rather than the result of inadequate intake or absorption

If the patient has a hypochromic microcytic anaemia a low serum iron combined with decreased iron binding capacity and low serum ferritin confirm that the anaemia is of an iron deficient nature Inadequate dietary intake of iron is unusual even in strict vegans but causes of malabsorption such as previous gastric surgery or coeliac disease should be excluded A simple rapid indicator of blood loss from the gastrointestinal tract is the use of faecal occult blood testing most methods use a guaiac reagent which when combined with haemoglobin and mixed with an oxidizing agent (eg hydrogen peroxide) turns blue Guaiac tests of varying sensitivities are available particularly insensitive slide tests (eg Haemoccult) are used for colonic cancer screening A more sensitive quantitative measure for gastrointestinal blood

loss is obtained by estimating faecal concentrations of injected chromium-51 labelled RBCs

Causes

Any of the causes of acute upper and lower gastrointestinal haemorrhage (*Figs 1* and *2*) may be responsible for chronic blood loss

Diagnosis (*Fig 6*)

History

A detailed history is important as this may suggest which investigations should be carried out first

History
- Examination including digital anorectal
- Proctosigmoidoscopy
- Haematological and clotting screen
- Faecal occult blood/chromium 51 blood loss

Special investigations
- Barium meal/barium enema or top and tail combined upper and lower gastrointestinal endoscopy

Other investigations
- Small bowel enema
- Mesenteric angiography
- Radionuclide scintiscanning
- Small bowel endoscopy

Fig 6 Diagnosis and management of occult gastrointestinal haemorrhage

General causes of blood loss such as clotting disorders or anticoagulant therapy may be evident A history of dyspepsia or dysphagia recent NSAID ingestion or chronic alcoholism suggests an upper gastrointestinal lesion Alternation of bowel habit with the passage of blood or mucus colicky abdominal pain with distension and noisy borborygmi all indicate a lower gastrointestinal tract lesion Anal pain prolapse or pruritus may indicate a local anorectal cause Family history of bleeding disorders peptic ulceration or colorectal cancer should be elicited

Examination

General examination of the patient may reveal important clues to the underlying lesion particularly skin lesions associated with hereditary disorders or inflammatory bowel disease (*Fig 7*) Abdominal masses may be palpable in inflammatory or malignant lesions Examination of the mouth may reveal pigmentation of the lips associated with Peutz Jeghers polyposis or aphthous ulceration suggestive of Crohn's disease Anal inspection may detect anal fissure prolapsing haemorrhoids or oedematous skin tags and fistulae suggestive of Crohn's disease Digital anorectal examination will reveal spasm in cases of fissure and lower or middle third rectal tumours should be palpable

Manifestation	*Disease*
Erythema nodosum, Pyoderma gangrenosum	Inflammatory bowel disease
Purpura/petechiae	Bleeding disorders
Spider naevi	Hepatic disease
Mucocutaneous pigmentation	Peutz Jeghers syndrome
Acanthosis nigricans	Gastrointestinal malignancy

Fig 7 Skin manifestations of gastrointestinal disease

Proctosigmoidoscopy

Rigid sigmoidoscopy should be carried out in the unprepared bowel as minor inflammatory changes may be masked by preparation Also the colour and consistency of the stool may be assessed together with any blood or mucus mixed in with the stool suggestive of a proximal lesion In most patients sigmoidoscopy should allow clear assessment of the distal 15–17 cm of large bowel Rectal biopsies may be taken from inflamed mucosa and should be obtained in all patients who have a history of diarrhoea as histological changes of inflammatory bowel disease may be detected even in the presence of apparently normal mucosa. Proctoscopy facilitates assessment and local treatment of haemorrhoids

Special investigations

Barium studies and endoscopy

High quality double-contrast barium meal or enema detects up to 90% of lesions in their respective areas If there is a clear indication of the site of bleeding the most appropriate investigation should be ordered In obscure cases barium enema should be performed first so that barium retained in the proximal bowel does not obscure the view

Barium enema in particular however may miss approximately 25% of neoplastic lesions as a result of technical or anatomical difficulties and it cannot visualize vascular anomalies If therefore upper gastrointestinal endoscopy and colonoscopy are readily available and are of high quality (i.e. >90% total colonic examina

tion) combined top and tail (upper and lower) gastrointestinal endoscopy at the same session should be the investigation of choice. This is not only more accurate but it allows histological confirmation of the diagnosis and facilitates the use of therapeutic measures such as polypectomy and haemostatic procedures.

Other investigations

Most common conditions will be diagnosed using the investigations described above. But, in the absence of a definite diagnosis a small bowel enema may detect a Meckel's diverticulum. Crohn's disease or small bowel neoplasia. Angiography may detect arteriovenous malformations and ^{99m}Tc screening may help to localize Meckel's diverticulum.

Finally, small bowel enteroscopy can be employed if the bleeding site remains obscure but the technique is tedious and prototype instruments do not give a high diagnostic yield.

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The effect of hand immersion on body temperature when wearing impermeable clothing

A J Allsopp and Kerry A Poole

Abstract

The effects of hand immersion on body temperature have been investigated in men wearing impermeable NBC clothing. Six men worked continuously at a rate of approximately 490 J sec^{-1} in an environmental temperature of 30°C. Each subject was permitted to rest for a period of 20 minutes when their aural temperature reached 37.5°C and again on reaching 38°C and for a third time on reaching 38.5°C (three rest periods in total). Each subject completed three experimental conditions whereby during the rest periods they either

a. Did not immerse their hands (control)
b. Immersed both hands in a water bath set at 25°C
c. Immersed both hands in water at 10°C

Physiological measures of core temperature, skin temperature and heart rate were recorded at intervals throughout the experiment.

Measures of mean aural temperature and mean skin temperature were significantly ($p < 0.05$) reduced if hands were immersed during these rest periods compared to non immersion. As a result the total work time of subjects was extended when in the immersed conditions by some 10–20 minutes within the confines of the protocol.

It is concluded that this technique of simple hand immersion may be effective in reducing heat stress where normal routes to heat loss are compromised.

INTRODUCTION

Individual body protection against a nuclear biological or chemical (NBC) threat for the Armed Services is provided by the NBC suit which is worn with a respirator. Different types of NBC protection are available and one design is investigated here: an impermeable protective suit which is made of a single layer of impervious material. However, the donning of such protective garments reduces the dissipation of heat from the body by the mechanisms of conduction, convection and evaporation. As the ambient temperature rises the body becomes increasingly reliant upon evaporative cooling and so the permeability of clothing to sweat is of particular relevance. Thus whilst an impervious suit offers the advantage of a simple method of protection from toxic liquids and gases it also has the disadvantage of impermeability to sweat. Clearly, poorly permeable garments are a hazard when working in the heat and are a contributory factor to heat stress fatalities.[1]

Methods to alleviate the resultant heat strain which arises from the additional physiological and environmental heat load described above have been diverse and many, for example the use of auxiliary cooling from liquid cooled garments[2] or gas ventilation systems,[3] although the latter is of limited use when working at high workloads.[5] However, such methods rely upon further equipment which is often heavy and reduces the mobility of the wearer.

Recent research into *hypothermia* has suggested that an alternative approach to cooling the body might warrant investigation. Work into re-warming the hypothermic victim has shown that men could be successfully re-warmed by immersing only the limbs in warm

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water[4] rather than using whole body immersion The authors of this research postulated that this technique was successful because warmed blood in the arteriovenous anastomoses (AVAs) in the hands and feet flowed directly to the body core via the superficial veins Thus the warmed blood bypassed the counter-current heat exchange system of the deep veins and the cool tissues of the arm

More recently it has been conjectured that the reverse might also be true and that this mechanism might be utilised to cool the *hyperthermic* victim[5] Researchers have shown that when men wearing chemical protective clothing immersed their gloved hands into warm or cool water this reduced the rate of rise of core temperature whilst working in the heat[6]

The aim of this present work was to extend the above experiments in order to investigate the effects of hand immersion at progressively elevated levels of body temperature This was conducted using two different water temperatures on men wearing impermeable NBC clothing at rest following periods of work in the heat

METHODS

The experimental protocol was approved by a local ethical committee prior to subject recruitment

Subjects

Six male volunteers aged between 24 and 37 years of age acted as subjects for the experiments All six subjects were familiar with NBC clothing and respirators Following a full medical examination which included a 12 lead electrocardiogram (ECG) and before giving his written consent to participate each subject was fully informed about the nature of the experiments and the potential risks

Procedure

Each subject performed three experiments in which the conditions were as follows

a No hand immersion (control)
b Immersion of both hands in a water bath set at 25 C
c Immersion of both hands in water at 10°C.

The subjects wore the same clothing for each experiment as follows underpants No 8s (standard cotton/polyester shirt and cotton trousers) and an impermeable NBC suit together with a respirator (type S10) and NBC cotton inner gloves under rubber outer gloves On the feet [1]Goretex insoles with rubber seals at the calf were worn inside standard (DMS) boots

A repeated measures Latin Square experimental design was employed whereby all six subjects were exposed to each of the conditions once At least one day was left between successive experiments and the subjects undertook the tests at the same time of day The subjects rested and did not smoke eat or consume alcoholic or caffeinated drinks for at least 2 hours before each experiment

The exposures were conducted inside an environmentally controlled chamber at a temperature of 30°C dry bulb 50% relative humidity Inside the chamber baseline measures were recorded for approximately 30 minutes The subjects then commenced work This comprised of a stepping exercise up to a height of 22 5 cm at a rate of 20 complete steps min a metabolic work rate of approximately 490 J sec [-1] The aural temperature of all subjects was monitored continuously in both ears When the aural temperature of a subject reached 37 5°C (in either ear) he was instructed to stop and immerse both of his hands to a level just above the wrist in a water bath (Grant Instruments Cambridge) at the prescribed temperature (25°C and 10°C) or just rest (control) for a period of 20 minutes At the end of this rest period he recommenced work until his aural temperature reached 38 0°C when he sat and rested as before for a further 20 minutes. The subject then recommenced work until his aural temperature reached 38 5°C and then sat for a final 20 minutes as already described. Subjective measures (see below) were recorded at the end of each work and rest period throughout the experiment The subjects left the chamber at the end of this third and final 20 minutes rest period The whole procedure was completed in approximately two and a half hours Successive work and rest periods are designated W1 R1 W2 R2 W3 and R3 hereafter

Experimental Measures

Core temperature was measured to an accuracy of 0 05°C using aural thermistors (Grant Instruments Cambridge) in both ears insulated with cotton wool and held in place by elasticated net Skin temperature was measured by skin thermistors (Grant Instruments) at five sites left upper chest right upper arm right anterior thigh, right shin and the right forefinger at the ventral aspect of the distal phalange (T_{fing}) At 3-lead ECG was obtained from each subject

throughout the experiment (Telecrist Telemetry System Siemens Denmark) Heart rate was determined from the ECG and recorded at 5 minute intervals. Sweat production and evaporation rates (kg hr) were calculated from differences in the unclothed and clothed weights of subjects (to the nearest 5 g) both measured prior to and at the end of exposure Allowance was made for fluid intake and the results expressed per unit exposure time Water was allowed ad libitum via the drinking tube of the respirator all subjects being encouraged to drink at frequent intervals Expiratory gases were collected by Douglas bags via a snorkel adaptor taped to the expiratory valve of the respirator These mixed expired gas samples were collected at the end of each work or rest period and analyzed for CO (FM2 CO analyzer P K Morgan Rainham Kent) and O (Zirconia O analyzer P K Morgan) Gas volumes were measured simultaneously through a dry gas meter (Harvard Instruments USA) which gave a digital readout accurate to 0 1 litre Oxygen consumption and energy expenditure corrected to standard temperature and pressure dry (STPD) were then calculated Subjective measures of tiredness and thermal discomfort were assessed using an arbitrary sliding scale ranging from 0–13 units

Environmental temperature was measured by dry bulb and wet bulb thermometers (WBGT meter Grant Instruments Cambridge) positioned in the centre of the work area Environment temperatures were recorded electronically every 15 minutes.

The leads from the monitoring sensors exited the clothing at the neck The skin and aural temperatures were recorded automatically every 2 5 minutes by a recorder (1200 squirrel Grant Instruments Cambridge) Mean aural temperature ($\bar{T}_{a,}$) was calculated from left and right ear thermistors Mean skin temperature ($\bar{T}_{s}$) was calculated from the weighted division of the sum of temperatures recorded at four skin sites (chest forearm thigh and shin) [8] The mean body temperature ($\bar{T}_{b}$) and heat storage (HS) were calculated from $\bar{T}_{sk}$ and $\bar{T}_{au}$ using the following formulae [9,11]

(1) $\bar{T}_{b} = 0{\cdot}65\ \bar{T}_{au} + 0{\cdot}35\ \bar{T}_{sk}$

(2) $HS = 3{\cdot}49\ \bar{T}_{b}\ Wb$

where $\bar{T}_{b}$ is the mean body temperature (°C) $\bar{T}_{au}$ is the mean aural temperature (°C) $\bar{T}_{sk}$ is the mean skin temperature (°C) 3 49—the specific heat capacity of the body tissue (kJ kg °C) Wb—the body weight (kg) and HS—the heat storage (kJ)

Statistical Analysis

Data were analyzed by analysis of variance (ANOVA) using a linear additive model for the effects in the Latin square design The interaction of the main factors of conditions subjects and the sequence of exposures was investigated and different time profiles between the conditions examined using Scheffes method of multiple comparisons A small number of missing values were estimated by the computer model

RESULTS

Unless stated otherwise results are quoted at the 5% level of significance for a subject number of six

The environmental temperature recordings were dry bulb 29 4 ± 1 3 C wet bulb 21 7 ± 0 9 C (mean ± standard deviation)

All six subjects completed each experimental condition successfully with the exception of subject 1 on the final occasion (25°C) who was stopped during W3 with a heart rate in excess of 190 beats per minute (bpm) All subject recordings from left and right aural thermistors were in close agreement (<0 2°C) except on one occasion when the restraining bandage slipped during the experiment for which period the lower aural temperature reading was ignored

Values of $\bar{T}_{au}$ with time from the commencement of work, for one subject in all three conditions are depicted in *Fig 1* while mean values for $\bar{T}_{au}$ and work time for all six subjects are given in *Table 1* It can be seen from the results in *Table 1* that the rates of rise of $\bar{T}_{au}$ in W1 W2 and W3 were similar in each condition whereas the rates of fall of $\bar{T}_{a}$ in the first rest period (R1) were more rapid when the hands were immersed Greater differences between conditions were observed during the second and third rest periods (*Table 1*) Immersion in 10°C water resulted in significantly greater reductions in core temperature than those seen when the hands were immersed in 25°C At the end of the experiment, $\bar{T}_{a}$ of one subject in the 10°C condition had fallen below baseline levels

Mean work times in W1 for the three conditions did not differ but subsequent work times in periods W2 and W3 were significantly extended if the hands had been immersed during the previous rest (*Table 1*) In the immersed conditions work time was increased to a

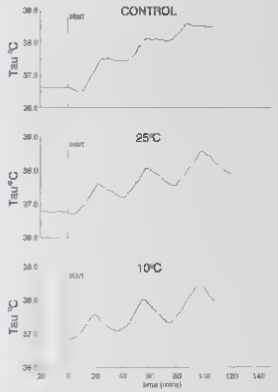

Fig. 1 The mean aural temperature profile of one subject in each of the three separate conditions

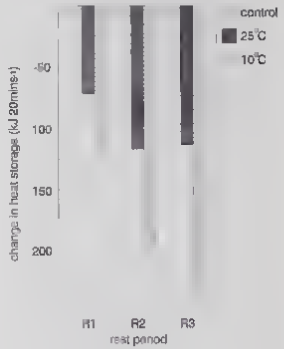

Fig. 2 Changes in mean heat storage (kJ 20 mins⁻¹) during rest periods 1 2 and 3

Table 1 Mean work time (mins) averaged mean rates of rise and fall of T_{au} (°C hr⁻¹) and mean T_{au} (°C) at the end of each work and rest period (n=6)

	Control	25°C	10°C
Work time W1	19 1	18 8	18 9
Rate of rise $\dot{T}_{au}$ in W1	3 90	3 95	3 93
Mean T_{au} at end of W1	37 46	37 43	37 48
Rate of fall $\dot{T}_{au}$ in R1	0 07	0 34	0 53
Mean T_{au} at end of R1	37 44	37 17	36 97
Work time W2	10 3	14 6	18 3
Rate of rise $\dot{T}_{au}$ in W2	3 90	4 02	4 27
Mean T_{au} at end of W2	38 00	37 99	38 00
Rate of fall $\dot{T}_{au}$ in R2	0 05	0 54	0 53
Mean T_{au} at end of R2	37 95	37 46	37 07
Work time W3	10 6	16 7	23 3
Rate of rise $\dot{T}_{au}$ in W3	3 60	4 11	4 22
Mean T_{au} at end of W3	38 47	38 52	38 51
Rate of fall $\dot{T}_{au}$ in R3	0 09	0 62	1 10
Mean T_{au} at end of R3	38 41	37 88	37 40

significantly greater extent if the hands were immersed in 10°C compared to 25°C

The alterations in $\bar{T}_{sk}$ followed the pattern described for T_{re} above During W1 $\bar{T}_{sk}$ was very similar for the three conditions but in the rest periods immersion produced considerably greater falls especially in the colder water (see *Table 2*)

Table 2 Average mean skin temperature (°C) at the end of each work and rest period (n = 6)

	Control	25°C	10°C
W1	36 92	36 85	36 87
R1	36 95	36 53	35 34
W2	37 30	37 23	37 22
R2	37 31	36 79	36 49
W3	37 58	37 50	37 53
R3	37 77	37 19	36 80

The changes in mean heat storage during each rest period have been calculated and are in *Fig. 2* As can be seen immersion produced significantly ($F<0.01$) greater reductions in mean heat storage if the hands were immersed The greater loss of heat seen in 10°C compared to 25°C in R1 increased significantly ($F<0.01$) with subsequent immersions

The mean values for T_{fing} are presented in *Table 3* It is apparent that in the control condition finger temperatnre rose with the temperatnre of the body antil the end of the final rest period, whereas in the immersed conditions significant reductions in T_{fing} were observed by the end of each rest period with the greatest effect being ascribed to the 10°C immersion condition A tendency for T_{fing} to fall to a lower level at the end of R3 compared to previous rest periods (to a minimum of 18 9°C in one snbject) was also noted This trend was

Table 3 Mean finger temperature (°C) at the end of each work and rest period (n = 6)

	Control	25°C	10°C
W1	36 42	36 00	36 47
R1	36 48	30 93	23 50
W2	37 03	35 87	35 77
R2	37 07	31 18	23 60
W3	37 53	37 06	36 98
R3	37 27	31 12	21 94

reflected in the lower (but not significantly) mean value at the end of R3

The minimum heart rates recorded for each rest period were significantly lower if the hands were immersed but no differences were observed between the two immersion conditions Mean minimum heart rates for the control 25 C and 10°C conditions were 115 107 and 103 beats per minnte respectively

For the three conditions mean fluid intake did not differ significantly (620 g hr 408 g hr and 412 g hr for the control 25°C and 10°C respectively) although the mean rate of fluid intake on the first day of experimentation (249 g hr) proved to be significantly lower than on the seeond (545 g hr) or the third day (646 g hr) The mean rates of sweat production for each of the three conditions differed significantly ($P<0.01$) being 1143 g hr ' 996 g hr and 878 g hr for control 25°C and 10°C respecuvely There was no significant difference between the conditions for rate of sweat evaporation (mean values being 122 g hr 91 g hr and 74 g hr for the control 25°C and 10°C respectively)

Subject scores of tiredness and thermal discomfort in each work period rose progressively with time from 1 2 to 4 3 units and 3 0 to 4 8 units respectively with no differences between conditions However both measnres showed significant differences ($P<0.001$) between the three conditions by the end of rest periods At this time scores for the control condition were higher than those for the two immersion conditions which were not dissimilar

DISCUSSION

These results indicate that when core tempera ture was elevated and normal heat losses restricted by impermeable clothing, then immersing the gloved hands in cool water significantly increased the rate of reduction of core temperature As a result in the immersed conditions the period of time each subject could work before reaching the next aural temperature threshold was longer

The heat storage values in *Fig. 2* indicate that the maximam heat dissipation in the coldest immersion condition during R3 was approxi mately 237 kJ 20 mins or 198 J sec The theoretical rate of blood flow to dissipate approximately 100 J see from each hand is in excess of 95 ml min ' per 100 g of tissue It is assumed that the immersion of hands in water allowed a greater loss of heat by conduction

from the arterial blood flowing through the AVAs which became maximally dilated in order to dissipate the heat load. The higher loss of heat in the colder water is presumably a reflection of the steeper gradient. The fall in T_{tymp} over the course of the experiment is probably a consequence of altered insulation properties of the gloved hands: the cotton inner glove is likely to have become saturated with sweat reducing the insulation of the material. This gradual reduction of insulation may explain the greater heat loss in 10°C during R3 compared to R2.

Immersion of the limbs in cold water results in local vasoconstriction of blood vessels reducing heat loss [12]. In view of the greater heat loss it is assumed that local vasoconstriction did not occur in the hand immersion experiments reported here. This was presumably because the temperature of the immersed hand (mean finger temperature at the end of R3—21.94°C) was above the sensory threshold thought to elicit this response (approximately 15°C) [12]. Furthermore it is suggested that the raised core temperature may lower this temperature threshold for vasoconstriction ensuring that the AVAs remain open and thus maintaining peripheral blood flow.

It has been postulated that in a warm environment the AVA shunt vessels are open and blood is shunted directly into the veins of the fingers and hand. From here it passes proximally along the superficial venous retia [4]. In a similar experiment to that presented here men working in chemical protective clothing were shown to heat up less rapidly if they immersed their hands in cold water [4]. Heat losses in the order of 50 W at 25°C, 120 W at 10°C were recorded by these authors compared to the higher heat dissipation observed in this present study (approximately 0–10 W, 60–100 W and 100–200 W for the control 25°C and 10°C conditions respectively). This may be due to the different protocol used whereby subjects worked for 20 minutes on a treadmill and then immersed their hands in water whilst continuing to work for a further 20 minutes. Thus in these experiments mean rectal temperature did not rise above 37.6°C in any condition and so any potentiating effect core temperature may have on heat loss would have been small.

The heat losses in this present study are also considerably higher than those reported for liquid cooled garments [5] (90 W) or a wetted cover [15] (40 W). In these investigations however an impermeable garment was not worn and therefore heat loss by other routes would not have been prevented.

The lower sweat production in the immersed conditions is likely to be due to the lower core and skin temperatures seen in these conditions. Both of these temperatures are known to influence sweat rate [17].

The results from the subjective tests indicate the desirable effect of improved thermal comfort and a reduction in perceived fatigue with hand immersion. This is in agreement with other studies of head cooling [16,18]. Such cooling may reduce performance impairment during heat exposure [20].

It is concluded that core temperature may be reduced and as a result overall work time in the heat may be extended considerably if rest periods are permitted during which the hands are immersed in cold water. Further investigation is required to determine the effectiveness of this technique when wearing semi permeable as opposed to non-permeable clothing and to make direct measures of heat loss and blood flow in these immersion conditions.

ACKNOWLEDGEMENTS

The authors are grateful to those who participated as subjects in this study without whom this work would have been impossible. Thanks are also due to Dr M J Tipton for his advice in preparing this paper and his contribution to the design of the experiments and to Dr R J Pethybridge for assisting with the statistical analysis. Finally we wish to acknowledge the assistance of C A E M Moncaster, P O Batchelor and Mr J. House in conducting these experiments.

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ROYAL NAVAL MEDICAL SERVICE v ROYAL ARMY MEDICAL/DENTAL CORPS

The annual soccer encounter took place on 7 December 1990 at RNH Plymouth with manpower commitments restricting player availability for both sides. On a wet and windy day the honours went to the RN team who ran out 4–1 winners with the goals provided by CPOMA Andrew (3) and POMA Meechan (penalty).

The team was

Lt Kennedy
CPOMA Andrew
POMA Meechan
POMA Neaves
MT7 McCulloch (Substitute PMA Ryan)
MA Megannagall
LEM(G) Egan
LMA McMenemy
POMA Smith
LMA Hanlon
POPTI Tichias (Remedial Gymnast)

On completion of the match Commander R Pollard awarded the Chatham Tankard to the winning team and the Man of the Match Trophy to CPOMA Andrew.

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Medical audit: A Well Woman Clinic in the Royal Naval training practice, Gibraltar

P R Westwood

Abstract

In order to assess the effectiveness of patient self selection and the value of dedicating surgery time to a specific clinic attendances at a Well Woman Clinic were compared with attendances for the same reasons at other times. During the nine month audit period the opportunity was also taken to overhaul the Age/Sex Register and assess the uptake of Cervical Screening at the Garrison Medical Centre. This unit is part of the Royal Naval Training Practice in Gibraltar.

INTRODUCTION

During the period 1st April to 31st November 1989 records were kept of all attendances at the Garrison Medical Centre Gibraltar. Consultations at a weekly Well Woman Clinic (WWC) were compared with those during other surgery times when women attended for the same reasons. The intention was to assess whether patients effectively self-select attendance at a special clinic and whether concentrating particular patients and resources in such a clinic is worthwhile. During compilation of records the opportunity was taken to overhaul the Age/Sex Register and audit the uptake of the Cervical Screening programme.

The Practice

During the audit period the Southern part of the Royal Naval Training Practice in Gibraltar served 1817 patients, most being Army personnel and their dependents. They mainly lived in the area between the Royal Naval Hospital and the Europa Point Lighthouse, although some lived in Town and a few in a more "rural" area half way up the Rock between the two packs of Barbary Apes. About two thirds of the practice population had moved to Gibraltar shortly before the audit period as their battalion had replaced the previous Resident Battalion. The staggered arrival of their medical records however made both screening and overhauling the Age/Sex Register an easier task. This was backed up by a Family Questionnaire given out with the Practice Information Leaflet on registration.

The female half of the Age/Sex Register consisted of 736 patients excluding children at boarding school who were only out during the holidays. It showed a biased distribution with peaks in childhood (age 3) and in the child bearing years (age 27) and a tail-off to an age ceiling of 52 (*Fig. 1*). There were very few female soldiers, more male than female soldiers attended the WWC because of subfertility and sterilisation counselling.

The Aims of the WWC

When setting up the Clinic and the audit it was decided to define exactly what services it was intended to provide in order to achieve certain objectives largely as defined by Palmer[1] to screen for cervical cancer, breast cancer, hypertension and gynaecological disease; to promote family planning, to give subfertility preconception, early pregnancy and menopause counselling; to teach self examination of the breasts and to give health education and advice (*Table I*).

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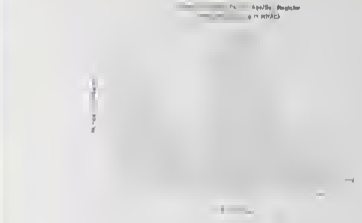

Fig 1 Female part of age/sex register (Total 736 including 11 WRAC)

Table 1 Services provided by the WWC

Contraception	Sterilisation
Subfertility	Pre conception
Early pregnancy	Post natal
General health	Cervical smears
Breast checks	Pelvic examination
Period problems	Menopause

It was also decided to include the 6th week post natal check in the clinic because of the opportunity this afforded to achieve many of the objectives and for the convenience of being able to give a longer appointment. *Contraception* included advice OCP and post coital prescription IUCD and diaphragm fitting and follow up. *Sterilisation* included counselling for both male and female operations, partners were seen together where possible. *Early pregnancy* included diagnostic testing and counselling for women who were pleased with a positive result and for those to whom one was unwelcome. *General Health* screening, education and advice was generally carried out as a part of other consultations. *Cervical screening* was mainly practice rather than patient initiated from a register constructed using data from the Age/Sex register patients notes and Family questionnaires. *Breast examination* was performed instructed or reinforced and *Pelvic examination* performed mainly as a part of other consultations. *Period problems* included Premenstrual Syndrome, painful periods and dysfunctional bleeding. *Menopause* counselling included hormone replacement therapy if appropriate.

The services offered were advertised at the surgery and in the Practice Information leaflet to enable patients to decide whether to attend the WWC or at other surgery times. Access to the clinic was open with cervical smears also by letter recall. Appointments were made via the Receptionist, using a time-slot mechanism the length of the slot depending on the service required.

Resources

Patients could choose either Practice Nurse or doctor both of whom where Family Planning trained, during the WWC or at other surgery times. The Practice Nurse also had a Tuesday morning OCP re prescription clinic. Both had consulting rooms and full examination facilities. The Medical Centre also had a limited dispensary comprising OCPs, IUCDs, diaphragms, sheaths and spermicides.

FINDINGS

Attendance

During the audit period there were 754 well woman consultations at all surgery times. Two hundred and ninety seven (39.4%) were during the WWC and 457 (60.6%) were at other times. There was a roughly even split between Practice Nurse and doctor in the WWC but more were seen by the doctor at other times. (*Table 2*)

Analysis of consultations by service required

Contraception

Contraception provided by far the biggest single

Table 2 Attendance

Seen by	WWC	Other times
Practice Nurse	139	141
Doctor	158	316
	Total 754	

Table 3 Attendances for contraception

		WWC	Other times
Advice	from Doctor	10	14
	from Nurse	7	4
OCP	from Doctor	18	76
	from Nurse	84	29
IUCD	fit	3	0
	check	6	2
Diaphragm	fit	4	1
	check	3	4
Sterilisation	male	15	1
	female	0	1

Table 4 Smears taken

	WWC	Other times
Doctor	26	13
Nurse	62	3
Totals	88	16

workload 251 consultations 33 3% of all attendances Most were for the OCP with relatively few for advice alone IUCDs diaphragms and sterilisation counselling (*Table 3*)

Three patients were seen for postcoital contraception all of them outside the WWC partly because of timing, and probably because they did not see themselves as well More women (76) tended to see the doctor for the OCP outside the WWC probably because they failed to tell the receptionist what their appointment was for the opposite was true for the Practice Nurse

Cervical smears

It is practice policy to offer screening for women within the first year of requesting contraception and 3yearly thereafter During the audit period 104 smears were performed 85% of them in the WWC (*Table 4*)

At the end of the audit period out of 477 women deemed to be at risk, 457 (96%) were in date for a smear by our criteria including 16 (3%) with abnormal smears requiring more frequent follow up or referral for treatment Ten (50%) of the 20 women out of date for a smear had appointments booked The remainder had been sent reminders Most of the 104 who had smears performed had been invited to attend the rest were screened opportunistically mainly at the post natal clinic It can be seen from *Table 4* that women were able to choose who was to do their smear Out of the 104 smears taken 16 (15 4%) were abnormal 12 inflammatory 1 HPV 2 borderline dyskariosis and 1 CIN 2–3

Counselling

Figures for patients attending for the various forms of counselling were grouped together for comparison purposes (*Table 5*)

Table 5 Attendances for counselling

Type of counselling	WWC	Non WWC
Subfertility	8	13
Preconception	1	5
Early pregnancy/ PDT	0	122
Health advice	3	17
Period problems	4	49
Menopause	1	2
Totals	17	208

It can be seen that most women attended for counselling outside the WWC probably because they saw themselves as ill rather than well women Indeed most of those in this group who were seen in the WWC were seen as booked reviews from other surgery times This was certainly true for *subfertility* Very few attended for *preconception* advice *per se* although some was giving during attendances for

other reasons. Most of the 122 people attending during *early pregnancy* were seen by the Practice Nurse (75 or 61.5%). These were mainly for diagnostic testing to confirm pregnancy. The remaining 38.5% seen by the doctor were not sure why they had missed periods or were not happy about a suspected or confirmed pregnancy. The 'unhappy' group were counselled and usually if pregnant continued with the pregnancy. To the best of the author's knowledge only three patients underwent terminations during the audit period. Terminations are illegal in Gibraltar so these women arranged their own flights to the UK, and subsequent operation. *Health advice* was mainly requested from the Practice Nurse (90%) and mainly outside the WWC (85%). Very few attended the WWC for *period problems* or PMS and out of the three attendances for advice concerning the *menopause* two were for re-prescription of HRT.

6th week post-natal checks

As explained previously these were usually booked during the WWC mainly for convenience and the opportunity to screen and advise. There were 33 attendances: 26 (79%) during the WWC and seven (21%) at other times.

Gynaecological illness

There is obviously some overlap between this section and *counselling*. The distinction however is that reasons for attendance in this section were wholly patient selected, but those in counselling were advertised as services provided by the WWC. As expected very few women attended the WWC for illness but as *some* did these groups are included (*Table 6*).

One hundred and eighteen women attended because of these illnesses: 17% during the WWC and 83% at other times ("Other" includes postoperative reviews, incontinence, dyspareunia, a lost coil and some soldiers with sports injuries).

There were 19 referrals to hospital from the WWC mainly for vasectomies and abnormal smears and 16 from the same types of consultations at other times mainly for menstrual disorders and incontinence.

DISCUSSION

As far as self-selection is concerned, patients mainly seemed to see the WWC as a contraception clinic and tended to attend at other surgery times for reasons needing counselling.

Table 6 Attendances for gynaecological illness

	WWC	Non WWC
Infections	9	64
Breast problems	1	13
Postnatal depression	2	7
Other	8	14
Totals	20	98

Largely practice initiated attendances were predictably better selected (smears, reviews, postnatals etc.). Women usually appropriately elected to attend with gynaecological illnesses during non-WWC surgery times.

It was thought to be worthwhile concentrating such a group of patients into a specific clinic: 39.4% of patients attending at all times for these reasons came to the WWC. The WWC however accounted for only 17.6% of the available surgery time—excluding other special clinics and tutorial time.

The advantages were felt to be: greater flexibility in appointment lengths, grouping similar consultations together, thus meaning more efficient use of resources such as the steriliser and dispatching smears, relieving other sessions and giving patients the choice to see either the doctor or the Practice Nurse.

Possible disadvantages were: patients might feel that other people would know what they were coming for on that afternoon leading to embarassment; they would attend at other times anyway; and that the Practice Nurse's examination facilities were in the general Treatment Room with less privacy. At other times there would be more chance to use the doctor's examining room.

Reviewing the Age/Sex register was a useful exercise. Many dead cards, duplicates and "ghost" patients were weeded out. The register also provided the data for the cervical smear recall register.

The 96% uptake of the cervical screening was felt to be due to a number of factors.—

1. The very fact that an audit was being carried out made the system more efficient.
2. There had been other opportunities for screening prior to the audit period. All people going to Gibraltar are required to have a medical with their previous GP before leaving the UK, all documents could be perused and summarised on their arrival and more women out of date for a smear

could be detected on the return of the completed questionnaire
3 Because of the biased age distribution the patients were more likely to attend or be seen for other reasons eg ante- and post natally and for contraception
4 The high pregnancy rate gave more opportunity for screening

RECOMMENDATIONS

1 Patients self selection could have been improved by more effective advertising of the services offered by the WWC in order to promote counselling as a service not just for illness Given time however the patients may become more familiar with the system
2 The possibility of the Practice Nurse having her own examination facilities should be explored This would give her patients more privacy
3 A further step in evaluating the WWC would be to canvass the patients opinions—a possible future survey
4 Regular review of the Age/Sex register should be carried out because of the continual turnover of the practice population

Overall the audit was felt to be a useful exercise both in evaluating and improving the service it studied

ACKNOWLEDGEMENTS

The content of this paper was originally presented at a postgraduate meeting at the Royal Naval Hospital Gibraltar on 15th November 1989 prior to the collection and addition of the final two weeks' statistics

The author would like to thank Sister Liz Borge SRN and the staff of the Garrison Medical Centre Gibraltar for their assistance in the audit and Surgeon Commander Brian Lambert Royal Navy for his help and encouragement during Vocational Training and for his advice on this paper

REFERENCE

1 Palmer KT *Notes for the MRCGP* sect 3 3 Oxford Blackwell Scientific Publications 1988

J roy nav med Serv 1991 77 55–58

Some recent Naval engagements

M R O Connell

(Based on a paper presented to the Royal Society of Medicine in March 1990)

INTRODUCTION

Military medicine as a component of the military machine, is preoccupied with preparing for that greatest of all disasters war in the hope that it will never happen Such preparation inevitably depends upon previous experience some of which may be recorded if not necessarily applied This paper follows on experiences gained by personael from the Department of Psychiatry Royal Naval Hospital Haslar ranging from the Falklaad Conflict in 1982 to the bombing at the Royal Marines School of Music Deal in 1989

HISTORICAL BACKGROUND

For the first two years of World War I the British and French armies evacuated their psychiatric casualties to the rear [1] Eventually for a number of reasons, including political treatment was applied close to the Front Line in the hope of returning the cured to the fighting Unwittingly the French and British were repeating lessons learned by the Russians ten years earlier in their conflict with the Japanese It was Dr Thomas Salmon an American investigating illness in the British and French forces on behalf of the US Surgeon General following the entry of America into World War I who completed the triad of Proximity Immediacy and Expectancy (PIE) The closer to the Front Line and the sooner was the casualty treated with the expectancy of his returning to duty, the less were the numbers evacuated to the rear

The lessons learned in 1904 were re learned in 1914–1918 only to be re learned again in 1939–1945 Indeed at the outbreak of the Korean War the Americans were actually in the process of building a large hospital in Japan to receive psychiatric casualties when Dr Glass Dr Salmon's successor in World War II intervened and reminded the authorities of the PIE principle which was then applied It could be argued that at long last a lesson had been learned and retained The Vietnam War emphasised that the whole lesson had yet to be learned for only after the Vietnam War had ended was it realised that casualties of war may present for the first time long after the last shot had been fired The phenomena of Post Traumatic Stress Disorder was clearly outlined in the American Psychiatric Association's Diagnostic and Statistical Manual 1980 (DSM III) and subsequently refined (DSM-III-R)

BACKGROUND—SPRINT (RN)

In 1978 Captain B G McGaughey of the United States Navy described the SPRINT coaecept [2] SPRINT standing for Special Psychological Rapid Intervention Team About the same time the Royal Victoria Hospital Netley the main base for psychiatry in the Royal Navy and the British Army closed This led to a re opening of the Psychiatric Unit in the Royal Navy Hospital Haslar and the opportunity for the then Consultant Adviser in Psychiatry to MDG(N) to update the concept of Forward Psychiatry as

Surgeon Commander O Connell is a Consultant Psychiatrist at Royal Naval Hospital Haslar

it applied to the Royal Navy and the Royal Marines Forward psychiatry is one of the eight roles indentified for military psychiatry by Ahrenfeldt [3] Suddenly in 1982 the Medical Service of the Royal Navy found itself mobilised in support of a Task Force following the invasion of the Falkland Islands by the Argentinians For the first time in the history of the Royal Navy psychiatrists and psychiatric nurses were deployed to sea in active support of front line units The PIE principle was applied About 5% of all casualties (about 50 in number) were of a psychiatric nature these were dealt with for the most part in the hospital ship SS *Uganda* and in the SS *Canberra* which had a hospital facility What was not appreciated at the time but which became apparent later on was the credibility attained by the psychiatric staff so involved

In 1984 the Flag Officer Sea Training requested advice in matters relating to preparation for the stress of battle In response to this request a package was devised detailing the basis for instruction in Combat Psychiatry in the Royal Navy In association with the preparation and release of this package there was an increase in awareness on the part of leaders at all levels in the recognition of acute and chronic symptoms of combat stress This led to the development of a treatment programme for the Post Traumatic Stress Disorder which had begun to present among survivors of the Falklands Conflict.

About the same time building on lessons learned in 1982 and in collaboration with our colleagues in the Army and the Royal Air Force the SPRINT concept was being actively exercised Essentially SPRINT is the introduction of a small team of mental health professionals following a disaster with a view to mobilising coping responses among survivors of the disaster and thereby reducing the incidence of combat stress casualties Teams were deployed at Dover at the request of Townsend Thoresen following the *Herald of Free Enterprise* disaster in 1987 a team was sent to the Gulf in 1988 to assist the crew of HMS *Southampton* after a collision at sea and the most recent deployment was to the Royal Marines School of Music Deal after the bombing in September 1989

AIMS

SPRINT aims to support the Command to identify and educate those at risk of stress reactions and to establish credibility in the event of late complications developing There is thus a circle of education leading to recognition as a result of which there is a request for help the response to which aims to provide support thereby achieving credibility which is crucial in further education as well as treatment of subsequent casualties

STANDARD OPERATING PROCEDURES

The Alert

In the case of the bombing at Deal the first indication that the psychiatric department had of the incident was a telephone call from a colleague at the Queen Elizabeth Military Hospital Woolwich offering help This was about mid day and the bomb had gone off at about 8 30 am

Team selection

By 12 45 pm a team had been selected from the three doctors and eight nursing staff who were in the department that morning Team selection was based on availability both from a domestic and professional point of view as well as a number of other factors The selection resulted in a team of four who were chosen for the following reasons

a *Chief Petty Officer Medical Assistant*— Team manager Experience has demonstrated the desirability of having in the Team an individual whose primary function is that of management rather than therapy The RN Medical Assistant is the backbone of the Medical Branch and in the case of the senior rating selected his previous service with the Royal Marines was an added qualification.

b *Medical Technician 1* This senior rating had recently completed a Post Traumatic Stress Disorder course as a Nurse Therapist and was familiar with the range of psychological trauma experienced by survivors of disasters

c *Superintending Nursing Officer* This nursing officer was chosen because of her gender as well as for her nursing skills It was anticipated that there might be an uncertain number of females both uniformed and civilian in the Base in addition to which experience has shown that the presence when appropriate of a female in the team significantly enhances the communication of distress

d *Consultant psychiatrist* The author was identified as Team Leader in the light of

his previous SPRINT experience and his regular contact with the Royal Marines which included lecturing on a regular basis at the Commando Training Centre Lympstone in matters relating to military psychiatry

Mobilisation

By 1 00 pm the team members had made contact with their families to advise them of the developing situation and together with the other members of the department were watching the 1 o clock News Transport in the form of a hire car had been arranged at short notice When the request came from the Royal Marine School of Music for assistance in the form of a SPRINT the team was in a position to respond within the hour with the full backing of the Medical Officer in Charge Royal Naval Hospital Haslar The time spent organising the composition of the Team and travelling to the scene of the disaster was also used to rehearse the modus operandi and to anticipate, in the light of information already available where the problems might lie Hence the advantage of being independently mobile

Briefing and being de-briefed

On arrival at Deal the team was briefed by the Base medical staff The Team Leader then made contact with the Commanding Officer of the Base in order to brief him in turn as to the composition of the team and intended mode of operation included in that briefing was the intention to leave five days later Early on it was discovered that, for good reasons the Trainee and Junior Bandsmen and Wrens had been sent home The PIE philosophy (o)indes where possible, the keeping together of those caught up in an incident to facilitate recall and working through the emotional reactions The Commanding Officer accepted the advice to recall those sent on leave and by the Wednesday evening all had returned It was also advised that normal activities be resumed as soon as possible The effect on the morale of the Base and the town when the band was heard practising on the Monday morning was very obvious The decision to parade the Staff Band through Deal with gaps in the ranks reflecting those who had fallen was also made following discussion between the Principal Director of Music and the Team Leader

In the days that followed key groups were briefed as to what might follow in the way of emotional reactions the emphasis being on the normality of these reactions to an abnormal experience One evening was spent with a group of local General Practitioners some of whom had been actively involved in the rescue work It was felt that it was important to allow them the opportunity to explore what the team was doing with the menfolk of their patients

'O Groups/Mutual support

A vital factor of the SPRINT concept is that of sound communication For the team to have credibility with the community being served there was a need for constant updating of information gathered on an individual basis As for the most part the team went about its task as individuals it was all the more critical that regular meetings be held hence the O Groups at fixed times These also served to prevent the duplication of effort and to alert the team as a whole to where the problems were developing There was as well the constant reminder of the team's aims but perhaps most of all it was demonstrating by example the importance of cohesion co ordination and communication The local medical team was involved in some of these O Groups The mutual support aspect applied to each member of the team in turn in the case of the Team Leader it culminated in being sent to bed one afternoon for a rest as there was perceived to be "burning that is to be near to burn out or being overloaded emotionally

Location

Notwithstanding the mixture of sex and rate, the team also aims to share the same accommodation On this occasion the team was able to use rooms in the Sick Bay This had the advantage of being relatively central without being too close to the bomb site and was an obvious base for a team working within the medical system Being based there also allowed the team to take over the running of the medical facilities for a few nights thereby affording the Base medical team some much needed rest There is nothing on the team's uniforms that labels them as mental health personnel to all intents and purposes they are doctors and nurses and their credibility with the military depends as much on retaining basic medical skills as well as developing special expertise

Facilities

The team expect to be able to work in the field be it afloat or ashore adapting to the conditions prevailing at the time On this occasion the

team were able to use a secure area that is with no harassment from the media with ample space for consulting and short term rest/sedation as required The constant availability of ample hot water both for drinks and bathing/washing, worked wonders for those doing the serving as well as those being served Of particular importance was the use of a telephone which allowed for among other things constant communication with the team s base and seniors

Pull out

The need to establish a pull out date/time has already been referred to above This is essential for two reasons of which the most important is to underline the Expectancy concept ie that the community is expected to cope once it has mobilised its own resources For the team to stay longer would suggest otherwise The second reason is to preserve the team's own health Working a 16 hour day in such an emotionally charged atmosphere is demanding fatigue develops notwithstanding attention being paid to sleep discipline

Follow up

The team has visited Deal twice since the original deployment The second visit was in November 1989 and allowed for follow up of some of the 78 individuals originally assessed as being most at risk of significant adjustment reactions Twelve different groups of people who were directly or indirectly affected by the bombing were identified For the most part the team chose to concentrate on survivors both injured and non injured, and the relatives of key Camp personnel A deliberate policy of not extending the team s expertise beyond the Camp boundary was made if only because resources were limited The twelve groups identified were

a. Injured survivors
b Non injured survivors
c Those who might have been there
d Relatives of the dead
e Relatives of a b and c
f Rescuers
g Witnesses
h Medical teams
j Command
k Carers
l Correspondents
m Those previously traumatised

The team was particularly conscious of the latter group as a survivor of the bombing of the Green Jackets in Regents Park 1982 was due to attend the PTSD Programme commencing 10 October 1989 at the psychiatric department RNH Hasler The third visit in February 1990 was by way of wrapping up the acute response and a final debrief of the Commanding Officer

SUMMARY

The request for assistance from the Command, on the advice of the medical staff reflected earlier education of such personnel The ability to respond within an hour of being requested to do so was the result of constant paper exercises and the prior establishment of principles agreed by Command/Management The importance of working to agreed standard operating procedures and to be seen to be doing so cannot be over emphasised What those struggling to cope with the aftermath of disaster need is support Such support is most likely to result from Teams operating within clear guidelines and simple principles Where possible the Team should contain members known to key individuals in the community being served All these factors applied in the SPRINT response at Deal

REFERENCES

1 Gabriel RA No More Heroes Madness and psychiatry in War Toronto Collins
2 McGaughey HG US Navy Special Psychiatric Rapid Intervention Team (SPRINT) Report No 85 43 Naval Health Research Center San Diego California October 1985
3 Ahrenfeldt RH Psychiatry in the British Army in the Second World War Routledge and Keegan Paul London 1958

Book Reviews

ABC of Sexually Transmitted Diseases. 2nd edition Michael W Adler Pp 68 British Medical Journal August 1990 UK £10 95 Abroad £13 00

This excellent book is a collection of articles printed in the popular ABC series in the British Medical Journal Although AIDS has dominated the interest in sexually transmitted diseases other conditions continue to present a problem particularly to RN medical staff and this book provides a useful guide to them In line with other publications in this series it abounds in useful illustrations algorithms and tables giving a useful practical guide to management It is essentially a pragmatic publication with little discussion and no references and yet for all that I felt that sometimes its guidelines were not hard enough For example in the discussion on the treatment of gonococcal urethritis numerous different regimens were cited, without stating a definite preference This discussion also really failed to stress the importance of giving follow up tetracycline to obviate the problem of concurrent non-gonococcal infection It was obvious throughout the book that this is not consult of perfection and as it is meant to be a practical guide I felt in some circumstances it was relying too much on practice in a centre of excellence For example many STD clinics and certainly all ships do not have routine facilities for diagnosing chlamydial infections.

I suppose it is impossible to have a textbook of sexually transmitted diseases without mentioning AIDS and indeed the chapter on AIDS represented a nice summary of the condition but one wonders if it was really necessary in this publication when there are so many other references available The discussion about the life cycle of HIV would have been made much more understandable had there been a diagram accompanying it

In the chapter on syphilis I did not feel enough stress was made on just how important serupulous follow up and serological testing is

However despite these minor objections I think on all this an excellent publication and should be in every ship and sick bay library

AROM

AIDS and the Lung Eds David Mitchell and Ashley Woodcock Pp 110 British Medical Journal September 1990 UK £8 95 Abroad £10 00

This little book is a [illegible] from Thorny which have appeared and deal with the problems [illegible] ment with HIV disease The [illegible] that in Europe and North [illegible] cystis pneumonia occurs as the AIDS [illegible] 64% of cases and will occur several [illegible] people with AIDS As well as pneumo[illegible] lung pathologies are important in the [illegible] HIV infection The editors stress in the introduction that what they are offering [illegible] practical advice from people who have had [illegible] involved in the management of respiratory HIV involvement and they admit that much of what they say will be obsolete with the next five years

The advantage of this collection of articles is that opinions are offered by sexual different authors in their own part enlightened experience The disadvantage of this approach means that inevitably there will be some duplication As well as the extensive personal experience of the authors each article is backed up with an impressive reference to the literature much of it in the North American experience and this gives the reviewer considerable authority

The first article of infect on control recommends universal precautions for bronchoscopy staff but it does stress that this will add enormously to the cost This is an excellent review which can readily be applied to the precautions to be taken in other endoscopic procedures such as gastroscopy

The paper on the non invasive diagnosis of lung disease makes the point that some of these techniques are simpler and do not have the potential risk of nosocomial infection but they are non specific and may often have to be backed up by invasive disease to make a diagnosis

I was a little surprised to see no mention on the use of corticosteroids in the article in treating pneumocystis pneumonia but that does subsequently appear in the next article on the treatment of respiratory failure in PCP and gives a well balanced discussion of this controversial issue There is a useful discussion on the ethics and practicalities of nursing HIV positive patients in the Intensive Care Unit However there was an implication that bronchial suction could produce aerosols capable of transmitting HIV infection for which there is absolutely no evidence Altogether this was a useful collection of articles and should certainly be readily available to

anybody denying [illegible] in aspect of HIV infection

AROM

Medical Statistics on Microcomputers R A Brown and J Swanson Beck. Pp 103 British Medical Journal December 1990 UK £8.95 Abroad £10.50

This is a small reference book which ostensibly tries to explain how modern software programs can help evaluate the statistics of research and laboratory data. It makes several references to two software packages Minitab and Statgraphics it does not however restrict its descriptions to these packages and is much more a book about how statistical method should be applied. It goes into depth on the dangers of simply applying simple statistics and gives an insight into how one should apply various statistical methods in certain circumstances.

However it does highlight many of the traps in applying statistics without adequate understanding of the subject. It goes into depth on how to analyze data and to work out the best statistical method of use. Clearly with the advent of microcomputer software dealing with medical statistics there is a danger that people can pile data into the software without adequately understanding whether the statistical method used is appropriate or not. Overall it is a useful book that requires careful study to make use of it and could probably only be used by amateurs if they have already made a study of statistics with a more basic book on medical statistics

RFD

Obituary

Surgeon Captain David Herbert Kernohan CBE Royal Navy died 18 September 1990 in his 91st year.

David Kernohan was born on 24 October 1899 in County Antrim. He qualified at Queens University Belfast in July 1921 and was a creditable Rugby Football Blue.

He entered the Royal Navy as a Surgeon Lieutenant on 12 July 1923 was promoted Surgeon Lieutenant Commander 5 July 1929 and Surgeon Commander 5 July 1935.

In October 1936 he was appointed to HMS *York* as Fleet Medical Officer on the Staff of C/NC America and West Indies Station until June 1939 when after six months at RNH Haslar he went to RN Sick Quarters, Shotley as ENT Specialist. He was next appointed in May 1942 for two years to HMS *Hilary* as Squadron Medical Officer followed by four months at RNAH Newton Abbot as ENT Specialist. In his next appointment in July 1944 as Medical Officer in Charge RNAH Londonderry he was responsible for the opening of the hospital and was granted the Acting rank of Surgeon Captain until his promotion to the confirmed rank of Surgeon Captain in December 1944. In October 1945 he was appointed as Medical Officer in Charge RNAH Trincomalee where he served for nearly three years. On return to the UK in August 1948 he went to RN Sick Quarters Shotley as Medical Officer in Charge for a few months before being appointed to RNH Chatham as Surgeon Captain in charge of the Surgical Section. Two and a half years later he went to RNH Haslar in a similar post before returning to RN Sick Quarters Shotley as Medical Officer in Charge his last appointment on the Active List. He was placed on the Retired List in October 1956.

In October 1954 he was appointed QHS. He was awarded the CBE in 1957.

We have recently learnt of the death of Surgeon **Lieutenant Commander** P R Morgan Royal Navy in December 1990 and of **Surgeon Commander** J F Beagle VRD RNVR on 29 November 1990. We have also learnt of the death of Surgeon Lieutenant Commander (D) D R Webber Royal Navy on 2 February 1991 and also of Surgeon Commander J S Law Royal Navy on 2 March 1991. Any personal reminiscences will be welcomed by the Editor.

J roy nav med Serv 1991 77 63–67

SERVICE NEWS

ROYAL NAVAL MEDICAL AND DENTAL OFFICERS

NEW YEAR HONOURS 1991

Companion of the Bath
Surgeon Rear Admiral R E Snow LVO OBE QHP

APPOINTMENTS AND PROMOTIONS

As Deputy Surgeon General (Operations and Plans)
1 January 1991
Surgeon Rear Admiral D A Lammimman LVO QHS

As Medical Officer in Command Royal Naval Hospital–Plymouth
5 February 1991
Surgeon Captain M J Mann

As Professor of Naval Surgery
4 September 1990
Surgeon Commander R J Leicester OBE

To Surgeon Lieutenant Commander
P W Dryden R D S Wylie

To Surgeon Lieutenant Commander (D)
M W Aston A P Coyne D V Flanagan
P M Guest C G Hardman
D J McJarrow R M Wilstone

To Surgeon Lieutenant
D P Edwards

To Acting Surgeon Lieutenant
D P Bindhim

Provisional Selections for Promotion
30 June 1991

To Surgeon Captain
M Macleod

To Surgeon Commander
D V Lunn C J Cahill A S C Allison
A J Walker

To Surgeon Commander (D)
J D Victor

HIGHER QUALIFICATIONS

Surgeon Lieutenant Commander P H Loxdale—FRCS(Eng)
Surgeon Lieutenant Commander C E D Howell—FRCS(Ed)

CONSULTANTS, SENIOR SPECIALISTS AND SPECIALISTS

The following professional advancements are announced

Senior Specialist

Anaesthetics
Surgeon Lieutenant Commander D V Lunn

Ophthalmology
Surgeon Lieutenant Commander S Hague

Specialist

Nuclear Medicine
Surgeon Lieutenant Commander P M Kemp

Radiology
Surgeon Lieutenant Commander P J Baxton

Otorhinolaryngology
Surgeon Lieutenant Commander C J V Fenton

Occupational Medicine
Surgeon Lieutenant Commander R P Johnston
Surgeon Lieutenant Commander M S Smith

AWARDS

Surgeon Commander P J Raffaelli has received a Herbert Lott Naval Trust Fund Award for the NRPC 45 consist of the Department of Nuclear Science and Technology, Royal Naval College, Greenwich

NEW ENTRIES

Surgeon Lieutenant (D) J C Fenwick
Surgeon Sub Lieutenant M D Bransden
(Miss) L M Brunton P R Conner
C W Heath D S Mullett, R D A Newton
C A Parry D A Potiphar M B S Snowden
B C C Tornoyo

TRANSFERS TO FULL CAREER COMMISSION

Surgeon Commander R Adley
Surgeon Commander M K Dean
Surgeon Lieutenant Commander (D) G E Sidal
Surgeon Lieutenant P S Turnbull
Surgeon Lieutenant C A Hill

PLACED ON EMERGENCY LIST

Surgeon Lieutenant Commander (D) A F Coyne
Surgeon Lieutenant A Ramaswami

RETIREMENTS

Surgeon Rear Admiral R E Snow CB LVO QHP
Surgeon Captain K H Spears
Surgeon Captain R C Clark
Surgeon Captain (D) G D Sharpe
Surgeon Commander S B Merrill
Surgeon Commander (D) J H Barker
Surgeon Lieutenant Commanders A J Ashworth
M M Scott

It has been brought to the attention of the Editor that **Surgeon Commander D J C Walker RN** (Retd) has been appointed a Serving Brother of the Most Venerable Order of the Hospital of St John of Jerusalem.

[illegible] photograph [illegible] the whole of the [illegible] is Medical Department. In the Aft[illegible] with the Birds. Weekly [illegible] (OOW) Leading Medical Assistant R R [illegible] (OOW) and [illegible] (OOW2)
[illegible] photograph was

MEDICAL SERVICES

PROMOTIONS

To Commander
W N mmo-Scott

To Lieutenant Commander
J R Dalgleish D J Haves
M A Wagstaff

To Lieutenant
R P Kenney

CONFIRMED IN RANK

Sub Lieutenant S T Ollallaghan

HIGHER QUALIFICATIONS

Lieutenant P P Noble—MSc
CMT(R) G N Cooke—HDCR

AWARDS

Petty Officer Medical Assistant (O) A M Shenton HMS *Ark Royal* has received a Herbert Lott Award for proficiency

Chief Petty Officer Medical Assistant G Bennett Sick Bay Manager Britannia Royal Naval College Dartmouth has also received a Herbert Lott Award

Petty Officer Medical Assistant Alec Shenton receiving his Herbert Lott Award from Captain N E Rankin CBE in board HMS *Ark Royal*

QUEEN ALEXANDRA'S ROYAL NAVAL NURSING SERVICE

NEW YEARS HONOURS 1991

British Empire Medal
Enrolled Nursing (General) T M Kerr

PROMOTIONS

To Superintending Nursing Officer
C A Morris

To Senior Nursing Officer
L Jones J E W Kelley A J L Musgstoun

NEW ENTRIES

Senior Nursing Officers T C Ennis
R Kysh
Nursing Officer M E Proulx

TRANSFERS TO FULL CAREER COMMISSION

Superintending Nursing Officers J Bancroft
J E Lewis

TRANSFER TO MEDIUM CAREER COMMISSION

Senior Nursing Officer K McCarthy ARRC

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J R H Holmes *(Hunter)*
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To Acting Surgeon Lieutenant
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To Probationary Acting Surgeon Lieutenant
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No 2 Summer 1991 Vol 77

JOURNAL of the ROYAL NAVAL MEDICAL SERVICE

Contents

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Manuscripts should be prepared in the Vancouver style. They should be typewritten with double spacing and wide margins and should include title page, abstract (of not more than 150 words), introduction, method, results, discussion and references, each section commencing on a separate page. A convenient length is between 2000 and 3500 words plus essential tables or illustrations.

Tables and illustrations should be referred to in the text. Tables should be typed in double spacing on separate sheets. Figures should be professionally drawn, making due allowance for the appropriate reduction. Glossy, blank and white photographs should be submitted, unmounted, whenever possible. Titles and detailed explanations should be given in the legends which should be typed on a separate sheet.

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> Soter NA, Wasserman SI, Austen KF. Cold urticaria: release into the circulation of histamine and eosinophil chemotactic factor of anaphylaxis during cold challenge. *N Engl J Med* 1976; **294**: 687–90.
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1 The Vancouver style. *J roy nav med Serv* 1979; **65**: 179.
2 International Committee of Medical Journal Editors. Uniform requirements for manuscripts submitted to biomedical journals. *Br Med J* 1987; **294**: 1766–70.

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Frontispiece *RFA ARGUS* home to Naval Party 1044 the medical and nursing contingent in the Gulf during the conflict earlier this year

J roy nav med Serv 1991 77 71–74

Ice skating injuries: a survey of cases seen in an Accident and Emergency department

A P Newton

Abstract

Participating in sporting activities has its risks as well as its benefits. A simple study is described which documents the patients presenting at a casualty department after injury at an ice rink. Epidemiological data, risk factors and patterns of injury are discussed.

BACKGROUND

It is well known by sportsmen and doctors alike that the act of participation in a sport carries with it a risk of injury. It is also recognised that certain sports such as ice skating have a particularly high risk of injury associated with them.

A recent study from Fruitaud[1] looked specifically at injuries sustained by schoolchildren in the study group sports-related injuries accounted for over 20% of all documented cases of accidental injury.

There have been four previous publications in the medical literature reporting on injuries occurring at public ice rinks.[2,3,4,5] Three were conducted by accident and emergency departments shortly after the opening of a public ice skating rink within their catchment area; all three document a resultant increase in the departmental workload with ice skating casualties accounting for between 2.1%[5] and 4.0%[3] of all accidental injuries seen by the department.

One study[3] uses accident statistics to derive figures for the risk of sustaining an injury at an ice rink: the calculated overall risk of injury necessitating accident and emergency department attendance being 0.11%.

AIMS

This study was designed to document the injuries resulting from accidents at the newly opened ice rink in Gosport, Hampshire. In defining the protocol four specific aims were addressed:

1. To determine the important epidemiological features of the patient group (who, when and why).
2. To make an assessment of the type and severity of injuries resulting from accidents at the ice rink.
3. To make an assessment of the impact of the opening of the ice rink on the workload of the department.
4. To calculate an approximate figure for the risk of sustaining an injury at the ice rink for comparison with that calculated from previous studies.

METHODS

For a three month period following the opening of the Gosport Ice Rink, the Accident and Emergency Department at the Royal Naval Hospital, Haslar, completed record questionnaires for all patients attending the department who had been injured at the ice rink.

Nursing staff helped casualties complete the first part of a proforma recording age, sex, area of residence, skating experience, method of injury and time of presentation.

After treatment, the casualty officer completed the second part of the proforma record.

Surgeon Lieutenant Newton is presently appointed to the Royal Naval College, Greenwich.

ing diagnosis treatment disposal and follow up arrangements The casualty officer also classified injuries as being significant (those requiring either hospital admission or hospital follow up) or non significant (those discharged to their home with no further treatment and those in need of simple follow up such as suture removal etc)

First aid records maintained at the ice rink were also scrutinised to establish the number of minor injuries treated by the on site First Aid staff during the study period

RESULTS

During the three months of the study period 84 (2 18%) out of 3,848 patients seen in the Accident and Emergency Department stated that an accident at the ice rink had been the cause of their injury Over the same period the First Aid staff at the ice rink attended 156 patients 31 of whom were subsequently seen at the hospital all cases felt by the First Aid teams to be in need of medical attention were advised to attend the Accident and Emergency Department at Haslar it being the nearest casualty department to the rink

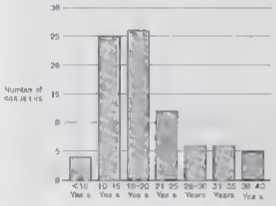

Fig. 1 Histogram to show the distribution of casualties by age

Epidemiological analysis of the study group

1 **Area of residence.** Seventy six per cent of the study group lived within five miles of the ice rink the remainder all lived within five and 25 miles of the rink (a radius which includes the cities of Portsmouth Winchester and Southampton)

2 **Skating experience** Of the study group 67% described themselves as being either first-timers or novices the remainder classifying themselves as proficient amateurs or experts

3 **Age of skater** The majority of the study group were teenagers and young adults the peak of presentations being from the 16-20 year old age group (*Fig. 1*)

4 **Time of presentation to the A & E department** The majority of presentations to the department occurred predictably during the hours of operation of the rink. The peak time for presentations was the four-hour period from 20 00 to 23 59

5 **Day on which injury occurred.** Over half of the patients sustained their injury at the weekend (Friday evening through to Sunday evening) The most common day on which to have sustained injury was Saturday

6 **Mechanism of Injury** Unprovoked fall onto the ice was given as the cause of injury by 64% of patients. Other causes quoted were collision with another skater collision with the rink barrier and off-ice injury (*Fig. 2*)

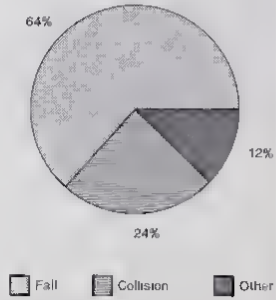

Fig. 2 Pie chart showing a breakdown of the statistics for the mechanism of injury as stated by the patient

Analysis of the type/seventy of injury sustained

Thirty patients (36%) sustained definite fractures 34 (40%) sustained minor musculo-skeletal damage (minor sprains/strains/bruising) and 17 (20%) sustained lacerations (*Fig. 3*). Thirty-seven patients (44%) were deemed to have received significant injuries. It was noteworthy that a greater proportion of the injuries sustained by patients in the age groups at the extremes of the age range were deemed as significant (*Fig. 4*). Fifty-four per cent of the injuries sustained by novice skaters were significant compared with 29% among the proficient/expert skaters

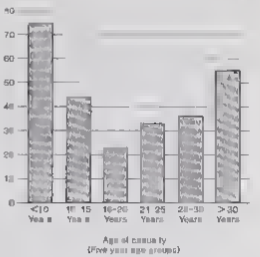

Fig. 4 Histogram to show the percentage of significant injuries within each age group (as a percentage of the total number of patients in that age group)

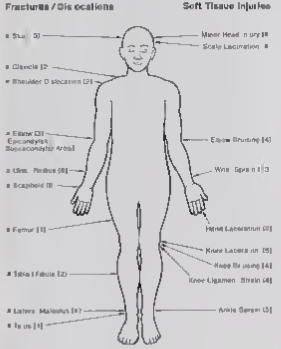

Fig. 3 A diagrammatic representation of the observed distribution of injuries

Treatment and disposal of patients

While in the Accident and Emergency Department a significant proportion of the patients in the study group required active diagnostic and/or therapeutic procedures. *Table 1* summarises the in house treatment given

The risk of sustaining an injury

From the ice rink's figures for utilisation of the rink (227 027 customers over the first three months of operation) the risk of sustaining an injury requiring accident and emergency department attendance was calculated as 0·037%. By combining the data from the study group and from the ice rink first aid records an approximate figure for the overall risk of sustaining an injury was calculated to be of the order of 0·1% (in agreement with a previously published report).[5]

Table 1 Investigations performed/Treatment given within the Accident and Emergency department

Number of patients in Study Group	84	
Number of patients requiring X-Ray	64	(73%)
Number of patients requiring reduction of a fracture/dislocation in the department	10	(12%)
Number of patients requiring Plaster of Paris immobilization of an injury	25	(30%)
Number of patients requiring wound suturing	14	(17%)

DISCUSSION

During the three months following the opening of the new public ice rink 84 patients presented to the Accident and Emergency Department

following accidental injury at the rink As might be expected novice skaters outnumbered expert skaters, and teenagers and young adults outnumbered the other age groups

Most injuries resulted from an unprovoked fall onto the ice an unattributable and largely unmodifiable mechanism of injury The type of injury varied from strains and sprains to long bone and skull fractures the most commonly injured areas of the body being (in order) wrist knee head and ankle

In this study ice rink casualties accounted for 2 18% of the department s workload a figure that correlates well with the observations of previous studies Of significance to the Accident and Emergency Department s workload the majority of injuries occurred in the evenings and at the weekends (a reflection both of the rink s opening hours and of leisure time availability to the resident population of the area) Also of relevance to the departmental workload was the high requirement for investigation (X ray especially) and for in house treatment (fracture reduction wound suturing etc) among patients in the study group

Although only an approximation (as inevitably some rink users took their injuries home with them) the calculated risk of sustaining an injury at the rink compared favourably with that from a previous study [5] The more reliable figure calculated for the risk of sustaining an injury necessitating accident and emergency department attendance is acceptably low at 0 037% for an active sport.

CONCLUSION

Increased availability of leisure time over recent years, combined with an explosive growth in the sport and leisure industry has resulted in the population of this country spending more time in sporting activities than ever before Although increased public participation in sport is recognised as being of benefit to the general health status of the population and as such is something to be encouraged it must be recognised that there will be a resulting increase in the number of sports-related injuries within the population resulting in an increased demand being placed upon certain sectors of the health service

ACKNOWLEDGEMENTS

I would like to thank the staff of the Accident and Emergency Department at the Royal Naval Hospital Haslar for their help with this project Thanks are also due to the staff of the Gosport Ice Rink for their cooperation and understanding.

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J roy nav med Serv 1991 77 75–77

The retrograde tunnel: a method for the fixation of central venous catheters in the military environment

R A Wheeler, T J W Spalding J A Thomas and G A Carss

Abstract
Central venous catheters (CVCs) are prone to accidental removal during patient transportation. Of the casualties who require transfer between medical facilities those with CVC in situ require additional vigilance to prevent loss of the CVC which continues to occur despite various methods of fixation. The fashioning of a subcutaneous tunnel has become an integral part of the placement of central venous catheters. Several methods have been described but the long term CVCs in paediatric practice pose special problems particularly that of the patients continually testing the CVCs fixation. Using a new polyurethane CVC a retrograde tunnelling technique has been developed which affords immediate and secure fixation. We propose that this CVC together with the technique of retrograde tunnelling is the solution to inadvertent central venous line removal during patient transfer.

INTRODUCTION

A variety of approaches both to the central veins and to tunnelling have been employed both under local and general anaesthesia.

The majority of CVCs in current use are uncuffed requiring stitch or taped fixation techniques

Surgeon Lieutenant Commander Wheeler RNR is a senior surgical registrar at the Wessex Regional Centre for Paediatric Surgery at Southampton General Hospital. Surgeon Lieutenant Commander Spalding is currently appointed to Royal Naval Hospital Haslar and Surgeon Lieutenant Commander Carss RNR is a consultant surgeon in the Accident & Emergency Department Queen Alexandra Hospital Portsmouth. Mr J A Thomas is a IVth year Medical Student at Southampton University Medical School

Cuffed CVCs were developed as a means of ensuring long term venous access in individuals requiring parenteral nutrition or cytotoxic therapy. The Hickman type line is introduced via an open cut down to the vein and the cuff lies subcutaneously.

One of the earliest descriptions of the subcutaneous tunnelling of CVC was for parenteral nutrition [1]

Until now the various tunnelling techniques for cuffed catheters have all been limited to an antegrade approach because the luer lock of the Hickman type CVC has been undetachable. Thus the catheter tip has had to be led through the tunnel from the exit before being delivered into the separate venotomy wound ready for introduction into the vein.

This means that the cuff on which the fixity of the CVC depends has had to traverse that section of the subcutaneous tunnel which separates it from the exit wound. The distal section of the tunnel is thus too wide to restrain the cuff.

An unrestrained cuff means an unfixed CVC, hence in the first postoperative fortnight various stitches elastoplasts and disabling manoeuvres are required to hold the CVC in place whilst tissue ingrowth into the cuff occurs. The recent reports[2,3] of various methods of securing cuffed CVCs in children whilst awaiting fixation are a testimony to this continuing problem.

This is the first description of the use of the retrograde tunnel which has been made possible by the use of a polyurethane CVC with a detachable hub (Cuff Cath Vigo Spectramed).

A method is described which ensures immediate secure CVC fixation

TECHNIQUE

The procedure may be carried out under regional or general anaesthesia. The central vein is cannulated by whatever technique is favoured. Our standard approach is a percutaneous puncture of the right subclavian vein via a 1.5 cm infraclavicular incision (*Fig. 1*). The vein dilator is introduced followed by a splittable sheath through which the pre-cut distal end of the Cuff Cath 16G catheter is introduced.

Fig. 1 Showing a Cuff Cath being introduced into the right subclavian vein through a splittable sheath which will then be split to allow the catheter to be fully inserted into the vein, leaving the cuff at the skin incision.

At this stage, the cuff is lying at the infraclavicular wound (*Fig. 2*). The flow switch is then cut off the proximal end of the CVC and the cut end sleeved over the steel tunnelling rod. This is then pushed subcutaneously to a point in the mid-axillary line at the level of the nipple and delivered through a 2 mm incision. The externalised section is cut to a convenient length and a second flow switch supplied in the pack is firmly attached (*Fig. 3*).

At the infraclavicular incision a small subcutaneous pocket is fashioned. By gentle traction on the CVC beyond the exit site, the cuff is pulled into the pocket and the wound closed (*Fig. 4*).

No further dressing or fixation is required. Nothing with a greater external diameter than the CVC itself has traversed the subcutaneous tunnel, so it is not possible to pull the cuff out.

When the CVC is no longer needed, the old wound can be reopened under local or general anaesthesia and the cuff externalised. The distal CVC is divided and pulled out at the exit site, the cuff and proximal CVC are delivered through the infraclavicular site and the wound closed.

Fig. 2 Showing the catheter having been positioned in the subclavian vein with the distal cuff positioned over the pre-marked skin puncture.

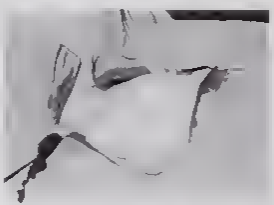

Fig. 3 Showing the catheter having been tunnelled retrograde from the venotomy site to the skin exit site, and the flow switch re-attached.

RESULTS

Sixty CVCs have been inserted in 53 patients using this technique, mean age 47 years (4 days—163 years), mean weight 15.6 kg (3.1—58). The mean insertion time was 13 minutes. The CVCs have been *in situ* for a mean of 111 days (range 15–364) a total of 6,363 catheter days. No cuffs have moved from the pocket, no CVCs have been inadvertently removed and there have been no problems with the flow switch.

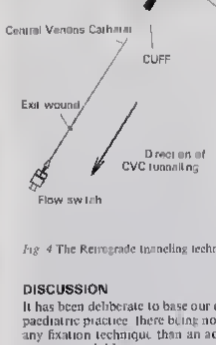

Fig 4 The Retrograde tunneling technique

DISCUSSION

It has been deliberate to base our experience on paediatric practice there being no better test of any fixation technique than an adventurous or inquisitive child

The Cuff Cath and its associated retrograde tunnel are nevertheless ideally suited to military practise where the CVC could be inserted when the casualty is being treated in either the second or third line trauma facility eg at the time of definitive surgery prior to casevac The fact that repatriation may be prolonged if by sea does not preclude the use of a CVC that has been shown to remain patent for many months

The tunnel was originally devised as a technique for reducing CVC sepsis in patients receiving long term parenteral therapy[1,4] but can also be used to secure the CVC While tissue ingrowth into a dacron cuff is an effective method for long-term fixation catheters can still be accidentally removed during the immediate postoperative period[2,3] To have immediate secure fixation at the time of CVC insertion seems a clear advantage

The majority of CVCs employed for short and medium term use (eg intraoperatively or in the intensive care situation) are uncuffed and require some form of anchorage usually supplied by a suture or adhesive tape

In such controlled environments where patient movement is minimal such fixation is satisfactory However the fact that the CVC is inherently insecure is reflected by the common practise of elective line removal as the patient leaves for the general ward despite a continuing need for venous access

In the military environment there is a need for transporting seriously injured casualties such as burns victims from second line medical centres the reliability and security of central venous access is clearly important The retrograde tunnel inherent with Cuff Cath would appear appropriate to this situation and offer significant advantages over conventional methods of CVC fixation

This particular CVC is manufactured in 14G and 16G sizes we have demonstrated[5] that the 16G Cuff Cath will deliver crystalloids at flow rates exceeding 1 000 ml per hour without a measurable rise in resistance

CONCLUSION

We feel that using a paediatric model we have demonstrated an effective way of fixing central venous lines to prevent inadvertent removal We conclude that critically injured personnel may benefit from this particular type of central venous catheter fixation

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Supersession of Surgeon Rear Admiral (Operational Medical Services)

Surgeon Rear Admiral R L Snow CB LVO OBE QHP (left) [illegible] post of Surgeon Rear Admiral (Operational Medical Services) on 5 March 1991. The handover [illegible] Admiral A L Revell QHS took place at Royal Williamstown [illegible] then headquarters of Operational Medical Services.

Surgeon Rear Admiral Snow joined the Royal Navy in 1966 [illegible] in Dublin and undertaking postgraduate training in Canada. During his naval career he has [illegible] afloat and ashore including HMY *Britannia* HMS [illegible] the Submarine Escape Training Tank, sports and MOD in London. Admiral Snow and [illegible] responsible for the conversion [illegible] of the design, planning and conversion of RFA [illegible] primarily receiving ships prior to their deployment in the Gulf. He is married with two daughters and lives in Petersfield, Hampshire.

J roy nav med Serv 1991 77 79–85

Stress and infection

D I Riddell

Abstract

The pattern of infective episodes during Royal Marines training over a four year period has been established. There were 4 529 attendances at the Sickbay with apparent infective episodes. Peaks of infection tended to follow three or more nights in the field suggesting that the resistance to infective insult was lessened following these field exercises.

The highest incidence of infection occurred during the final weeks of training when the physical and mental pressures were greatest during the Commando course. This often manifested itself as skin sepsis. A judiciously placed week of less stressful activity led to a major reduction in all infections at this stage of training.

This is evidence that physical and mental stress may lead to infective episodes. The phenomenon is having more fully investigated by the Institute of Naval Medicine.

INTRODUCTION

The Commando Training Centre Royal Marines prepares men for their specialist role in war. The 30-week training period is rigorous. The author noted that 67% of recruits had a probable infective episode, and that almost half of those who completed training (48%) were prescribed at least one course of antibiotics. The rate of infections over the four year study period was over 5 000 per 100 000 recruit training weeks and this seemed very high for healthy young men.

It was also observed that the infections did not seem to be the ones that would be expected in this age group. The laboratory only confirmed one case of glandular fever in four years. Conversely there were two cases of Guillain Barré syndrome giving an incidence of one per 2 000. 50 times commoner than the worldwide incidence of 1–2 per 100 000 [1]. There were 40 cases of shingles among the recruits in the Summer of 1985, an incidence of 50 per 1 000 who entered training during that period. This compares with an expected incidence of 2–3 per 1 000 [2].

Cruikshank *et al*[3] reported on an outbreak of Streptococcal pyoderma involving 1 300 cases, in 1979–80. They noted that the incidence increased from three per 1 000 up to week 24 of the syllabus to 52–57 per 1 000 in the final weeks of the course. Preventative measures introduced subsequently reduced the infection greatly, but in 1987 it was found that the incidence of Streptococcal or Staphylococcal skin infection at the end of the final exercise in week 28 was 43% [4].

There has been speculation that intense physical training is associated with an increase in infection [5]. This study will examine the rates of infection over a four year period and demonstrate the change that occurred as a result of modification of the course.

METHODS

Every two weeks a troop of 45–50 men join the Commando Training Centre (CTC). Their ages range from 16 to 28. Training takes place over a period of 30 weeks and is varied and demanding both physically and mentally. If the trainee misses more than a few days of training he will be backtrooped to the next troop so that he does not miss any of this intense training. If he requires longer to recover from injury or illness or to understand what is being taught him he will join one of the remedial troops. This study

Surgeon Commander Riddell retired from the Royal Navy in February 1990 but was Principal Medical Officer at the Commando Training Centre Royal Marines Lympstone from 1985–1988, the period covered by this study.

Table 1 Infections in Royal Marines recruits 1985–88

	1985	1986	1987	1988	Total
Skin sepsis	358	423	270	90	1 141
Respiratory	592	458	469	519	2 039
Intestinal	267	229	177	224	897
Other	115	131	90	136	472
Total	1 332	1 242	1 006	969	4 549

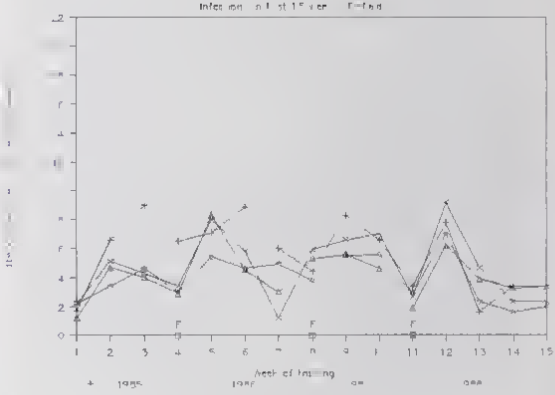


Fig. 1

considers only those recruits actually in training. The remedial troops are excluded.

Every week the number of recruits in each troop was recorded as was their week of training. Attendance at the Sick Bay was recorded whenever a recruit reported ill and details of infective episodes were extracted. Using this data the number of attendances due to infection per 100 recruits at risk for each week of training was assessed. A total of 3 984 recruits joined CTC during the study period.

RESULTS

There were 4 549 episodes of infection a rate of five per 100 recruit weeks. Of these 1 141 were skin infections. The results for the four years are shown in *Table 1*.

The first 15 weeks

This part of the syllabus has changed little over the four years. *Figure 1* shows the attendance rates with infection for the different years.

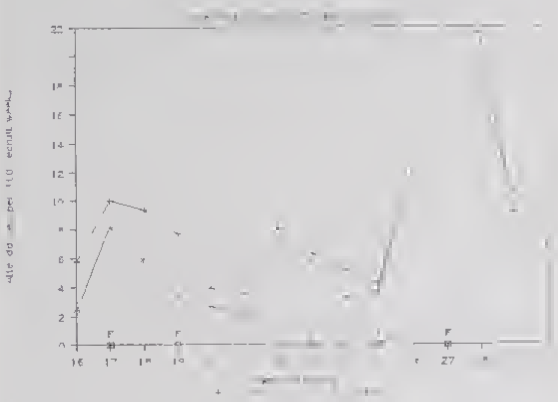


Fig. 3

There is an initial small rise in infective episodes This is a well recognised feature as susceptible men join from various parts of the country and are first exposed to new infectious challenges The next peaks are in weeks 5 9/10 and 12 The recruits are living in the field for three or more nights in weeks 4 8 and 11 just preceding these rises in infection

The second 15 weeks

In 1985 and 1986 the same syllabus was in use The recruits were in the field for three or more nights in weeks 17 19 23 and 25 Week 26 was the start of the Commando course In week 27 they were on their seven night final exercise and the Commando tests were run in weeks 28 and 29 *Figure 2* shows the peaks of infection in weeks 17/18 week 22 and weeks 26 to 29

Figure 3 shows infections for 1987 when a slightly different syllabus was in use Field periods in 1987 were in weeks 17 19 and 24 with the Commando course starting in week 25 Peaks of infection appeared in weeks 18 20 and 25 The rise in week 26 was lessened from 15 to eight but in week 28 there were similar numbers of infections to 1985 and 1986

In *Fig. 4* the results for 1988 are shown The recruits are in the field in weeks 17 18 and 23 The Commando course starts in week 24 but in week 25 there is a slightly less stressful week of resource and initiative training Peaks of infection now occur in weeks 19 22 and 24 The infections in week 26 match the improved figures for 1987 but in week 28 the rate has fallen from 17 in 1987 to four in 1988

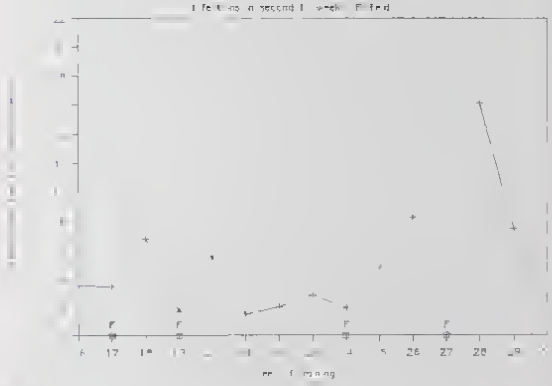
A summary of the changes in the rates of infection for weeks 26 28 29 and 30 is shown in *Table 2*

Skin sepsis

Figure 5 shows the problem over the four yearly periods of this study Apart from week 23 in 1985/86 the level runs at one to two attendances per 100 recruit weeks Then in week 26

Table 2 Infections per 100 recruit weeks during the Commando course 1985/88

Week	26	28	29	30	Average
1985	11 9	21 7	9 2	8 6	12 9
1986	14 1	17 7	10 5	6 9	12 3
1987	8 2	18 1	7 4	2 7	8 6
1988	9 9	4 7	6 7	3 1	6 1



as the pressure increases in 1985/86 the rate rises to eight and upwards to 11 in week 28 In week 29 it falls back to six In 1987 week 26 is four week 28 is eight and week 29 is three

The figures for 1988 show that the skin sepsis rate never rises above two per 100 recruit weeks and this has been confirmed by body inspections and swabbing.

DISCUSSION

It is apparent from the foregoing that there is a high underlying infection rate of five per 100 recruit training weeks There seem to be two factors that are increasing the infection rate The first and more obvious is prolonged high levels of mental and physical stress at the end of training. The introduction of a less stressful week in that period in late 1987 has had a beneficial effect on skin sepsis particularly Secondly spending three or more nights in the field seems to increase the infection rate

The Sickbay at CTC provides a full seven

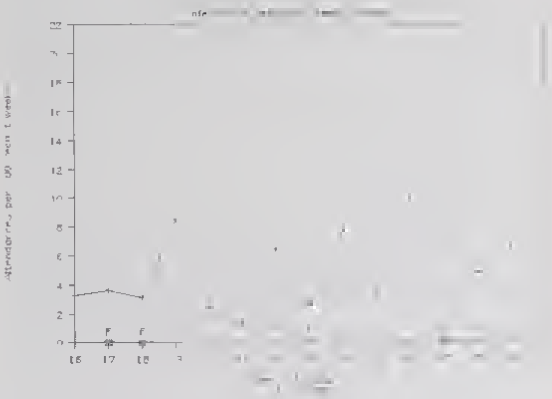


Fig 4

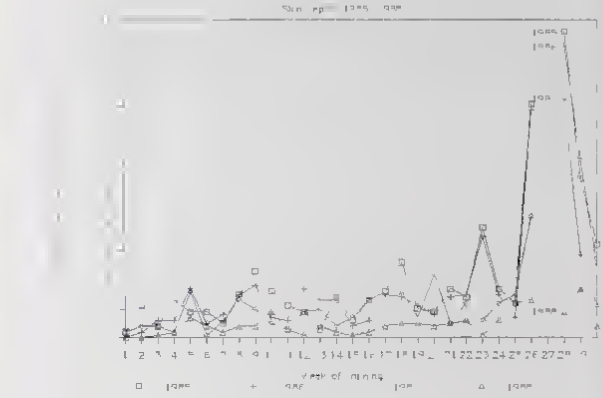
days a week service so men can report sick virtually when they wish Indeed, after being in the field many report sick with non infective problems

In the first 15 weeks there is a clear association between periods of three nights in the field and the occurrence of peaks of infections This is slightly obscured in 1985 in the first six weeks because of a three-month outbreak of Influenza A and B which affected most of the recruits who joined CTC for training at that time Otherwise the association is quite clear and repeatable (*Fig 1*)

The second 15 weeks are more difficult to interpret because of the syllabus changes and the high background level of physical and mental stress It would appear from these results that field exercises seem to be linked with rises in infection rates The high rate in week 22 in 1985 1986 and 1988 unconnected with a field exposure may be due to the physical test that must be passed in that week of training

The Commando course can now be examined This includes a seven night exercise and the Commando tests and is extremely taxing both mentally and physically In 1985/86 infection rates rose to 20 per 100 recruit weeks in week 28 By lengthening the course by a week in 1987 infection rates were slightly reduced The insertion of a less stressful week just prior to the course in 1988 has seen a great reduction in infective episodes This applies particularly to Streptococcal and Staphylococcal skin sepsis (*Fig 5*) where rates have fallen up to tenfold between 1985 and 1988 These infections used to cause considerable losses of training time [8]

Therefore there appears to be a connection between periods of three or more nights in the field high levels of mental and physical stress and infection Fieldwork is very stressful with a high level of physical activity (yomping pat rolling) constant fear of being attacked by the enemy little and usually broken sleep with a lot of nighttime activity no free time and often constant cold and wet Meals are always rushed



and life is generally uncomfortable. It is not surprising that the human body does not perhaps respond as well to infective insult as it might under better circumstances

These findings may perhaps add to our understanding of infectious disease in war. The Manual of Army Health[7] suggested that the high levels of infectious diseases in wartime were due to the crowding together of large bodies of men but this may not be the whole story. Traditionally infectious diseases have always been the cause of more casualties than enemy action.[7] For example in 1944 in the South East Asia Campaign malaria caused 176 000 casualties to be admitted to hospital battle casualties were 23 000. More recently when the Vietnamese withdrew from Cambodia in 1985 their Commander complained that every one of his men was suffering from malaria. It is necessary to have an effective immune system for malaria prophylaxis to work.[8] The data presented here would also appear to support the theories presented frequently in the national press over the last few years that intensive training affects our response to infection. The Royal Marine recruit at the end of training, is essentially a top class athlete. Training must be aimed at the average man and regrettably there will be those who fall below the average level. It is perhaps these men who fall prey to invading infective organisms.

CONCLUSIONS

It would appear that there is the evidence to suggest that recruits are more liable to infective episodes following the rigours of fieldwork for at least three nights and that very high levels of physical and mental stress as seen in the Commando course can lead to succumbing to infection. It is further demonstrated that a well placed period of comparative rest can reduce the occurrence of these infections. Certainly the phenomena described in this paper deserve closer investigation as they are simply the

extremes of the manifestations of stress. Even if it were possible to diagnose stress more accurately this would be of tremendous importance not only to the Armed Forces but to any organisation where stressful situations occur as a short period of reduced stress seems to produce beneficial results

The Institute of Naval Medicine is presently carrying out an extensive longitudinal study to try and determine what is going wrong.

ACKNOWLEDGEMENT

The author wishes to acknowledge the contribution made by Col Ian Moore and Lt Col Robert Ward Royal Marines in making these changes in training

ADDENDUM

In 1989 there were 9[illegible] attendances at the Stekbay with skin sepsis

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[illegible] for Surgeon Rear Admiral (Operational Medical Services)

Surgeon Rear Admiral Revell performing the opening of SRA(OMS)'s new offices at Maillard House, Mount Wise. The house is named after Surgeon William Job Maillard, the only Naval Medical Officer to be awarded the Victoria Cross.

From the left: Roy Gwyn, HEO (Quartering), a representative of the contractors, POMA Tim Singleton, Ken Hitchens, Admiral's driver, Ken Ford, Property Manager, Jill Sandey, Typist, Julie Paterson, Admiral's PS, Mary Megraw, EO (Works), Lieutenant Commander Frank Aced, Secretary, Surgeon Captain John Soul, Chief Staff Officer, Surgeon Rear Admiral Revell, Commodore Praeclin, Chief Staff Officer to Flag Officer Plymouth.

J roy nav med Serv 1991, 77 87–101

Intensive Stress?? Caring under pressure

G E Watkinson

Abstract

This article is based on a survey of the intensive care nursing staff at RNH Haslar and RNH Stonehouse. It examines individuals' responses to external stressors and was undertaken as part of a project for the Health Education Certificate Course. The survey took place during December 1989 and January 1990.

The prime purpose of this research was to explore whether high levels of stress existed among nurses on the Intensive Care Unit (ICU) at RNH Haslar. It also to discover the main causes of work related stress and in addition to examine how best to implement a nursing management strategy to enable these affected to cope with stress. However the pilot study carried out at RNH Stonehouse allowed a change in tack, enabling not only a comparison between external stressors on similar units but providing a much broader insight.

INTRODUCTION

Nursing is generally acknowledged to be a stressful profession [1]. Nurses frequently enter the profession to help people, to make a contribution to society, to restore patients to optimal health levels and to make living and dying more comfortable.

Since as early as 1960 *stress* and *burnout* have been cited in nursing literature as evident deterrants to the well-being of nurses and consequently to the quality of their nursing practice [2]. The expansion in technology on the Intensive Care Unit (ICU) over the last decade has increased the demands on the critical care nursing staff. A high level of knowledge of patients' problems coupled with clinical expertise in the use of sophisticated monitoring and life support equipment is required [3].

Continual exposure to life threatening crisis situations, critical decision-making responsibilities and an often over stimulating environment place critical care nurses in a high risk category for experiencing both emotional and physical stress [4].

The nurse may find herself in a conflict between the need to show compassion and warmth and the need to remain sufficiently objective to avoid inappropriate sympathy. It can be stressful for the nurse to have to continue caring and involving herself with a patient, knowing that the eventual outcome is probably death.

At times life is unnecessarily prolonged. This is a difficult situation for all health care professionals involved, and perhaps reflects society's inability to understand all the ramifications of medical technology.

Occasionally the nurse must provide emotional support for distraught family whilst carrying out the physician's orders to aggressively resuscitate a terminally ill patient whose agony is prolonged and whose death may be without dignity.

Nurses as decision makers are often in conflict with their own value systems in this quality versus quantity of life issue and those of the medical profession and the institution [5].

RESEARCH RATIONALE

The endemic shortage of permanent nursing staff is a feature in both United Kingdom Naval Hospitals and a number of National Health Service Hospitals. Agency nurses supplement the depleted shortfall as best they can, however in a specialist environment this can cause

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Table 1 1989 workload per month

Intensive Care Unit Royal Naval Hospital Haslar Annual Statistics 1989		ICU Statistics
Total Number of Patients	238	
Male Patients	146	61%
Female Patients	92	39%
Service Patients	17	7%
Service Dependants	3	1.2%
Civilian Patients	218	91.6%
Total Patient Days	916	
Number of Patients per day	2.5	
Average Stay/days	3.85	
Number of Deaths	33	14%
Number of Operations	159	
Number of Sepsis Cases	26	10.3%
Patients Ventilated	138	58%
Average Patient Ventilated/days	3.8	
Total Patient Ventilated/days	505	

Nursing Categories

Category A Any patient with higher than 1:1 Nurse ratio
IPPV
CAVH/CAVHD
527 Patient Days 57.5%

Category B Any patient requiring 1:1 nursing
Barrier Nursing
Peritoneal Dialysis
Tracheostomy or ETT when not ventilated
116 Patient Days 12.6%

Category C All other patients *273 Patient Days 29%*

problems. Intensive care nursing is all about *teamwork*. An experienced, well trained team not only does the job well but also takes the multitude of day-to-day problems/emergencies in its stride. A well-organised team works rather like a well oiled machine — smoothly. The non verbal communication that exists speeds reaction time and enhances effectiveness and efficiency.

In RNH Haslar the high turnover of staff in 1989 (86% of RGNs and 50% of ENGs combined) with an increase in the demands placed upon the unit during the summer caused high levels of stress to be experienced by most nurses and anaesthetists who are responsible for the day-to-day patient management on the intensive care unit.

When relief nurses were sent to help out the administrative problem was apparently solved in that nurses were bridging the gap. However one cannot oversee a nurse totally inexperienced in these settings and effectively make decisions for the remaining patients simultaneously.

Many nurses unlike their NHS counterparts do not always get to choose where they work. A number had joined Haslar's ICU prior to taking up an appointment/draft or leaving the Service staying a few weeks to three months. This lack of staff continuity caused great difficulty within Haslar no longer was there any slack left in the system to provide cover. It became vitally important that any new member of staff be they permanent or temporary was orientated into the ways of the intensive care unit quickly and effectively.

An orientation programme was developed to help meet the needs of new staff members however this programme took a minimum of eight weeks to complete. Its stated AIM was to quickly enable the new nurse to feel part of the *team* and to be a *safe practitioner*.

The identification of external stressors which were perceived as stressful would be essential in the development of any management plan or coping strategies for the staff A confidential questionnaire was felt to be the most effective non threatening way of gathering the required information Emphasising the confidential aspect of the questionnaire ensured that staff who might be reluctant to admit to feeling stressed due to fear as being seen as not being able to cope would give an honest appraisal

RESEARCH LITERATURE REVIEW

A literature review revealed that stress is pronounced for those working in critical care areas such as intensive care or coronary care units Intensive care units have been reviewed in the literature since their inception in the late 1950s and early 1960s Over the years much has been written about the stressful psychological experience of being a patient in such a unit Less well recognised, however was the stress faced by those working in critical care areas. The psychological state of the staff will in part determine how effective they are The quality of patient care depends greatly on those providing it, this is particularly true of the intensive care unit where a patient s life is at stake [5,6]

The awareness of the psychological state of the nurse has not come too soon In 1967 the British Medical Association (BMA)[7] published the first report on ICUs noting a distinct disadvantage of this type of health care unit Work on such units is an emotional strain on the staff" The report continued to acknowledge that the ICUs made great psychological demands on the staff particularly the nurses Staff turnover is cited as a barometer of stress and when high is claimed to be an onlward sign of increased staff stress and strain in such a working environment

The two Naval ICUs of course, have other variables built in affecting staff turnover for example drafting and Service requirements both units speedily responded by sending experienced staff to Dover following the bombing of the Royal Marine Barracks in Deal in September 1989

The need to decrease such high staff turnover rates in specialised units has been emphasised by Weeks [8] who argued that rapid turnover led in an ultimate decrease in the quality of care given Decline in quality of care feeds back into job dissatisfaction establishing a cycle

Hay and Oxden's[9] study was one of the first to address the psychological/internal stressors facing intensive care nurses More recently researchers have studied both the external and internal stressors External stressors are those located in the work environment. whereas internal stressors are those relating to the inner experience and personal characteristics of the care giver Hinkabay and Jaglal[10] found that nurses perceived externally controlled situations (eg heavy workloads or staffing problems) as more stressful than internal stressors However it must be remembered that not all stressors are perceived as stressful by all nurses There can be striking similarities between what is perceived as stressful or satisfying

A study by Bailey [11] involving 1 800 ICU nurses illustrated this point

Bailey found that categories such as interpersonal relationships and patient care were identified as both major sources of stress and also categories from which nurses received a great amount of satisfaction This emphasises the concept of cognitive appraisal and stress perception [12 13]

> Stress is either an environmental or internal demand which taxes or exceeds the adaptive resources of the individual [14]

Assuming that stress reactions are controlled by perception individual perceptions appear to be fundamental to the understanding of stress. Stressors may evoke a response in one nurse and quite another type of response in a second nurse External factors then can only be considered stress-producing if they are perceived by the nurse as such The question has been asked Do critical care nurses perceive more stress than non critical care nurses?" [4] These findings supported the above supposition

The ICU nurse may suffer stress caused by the isolation of the unit lack of privacy and a feeling of being trapped by the environment Thus is especially true when barrier nursing is in progress and low staffing levels do not allow regular relief the intercom being the only method of communication

The monotonous conditions and incessant routine may make the nurse feel like she is on a treadmill There may however be long periods of boredom with the sudden responsibility of instigating emergency treatment a constant state of readiness being required at all times As every procedure in the ICU is potentially life saving any error made could be life threatening [15]

Adequate appropriate coping mechanisms

need to be developed by the nursing staff to manage the day to day stressors faced on the ICU. Avoidance cannot be used as there is nowhere to hide. The nurse may defend herself from emotional involvement and further stress by depersonalising the care of the patient and may mechanise her job [13]. By keeping active the nurse has a feeling of mastery and control over the situation which will decrease feelings of helplessness. Cheerful denial is frequently used as a coping mechanism on the ICU.

> And it comes as a surprise to an outsider to observe routinely some of the nurses in the ICU joking and laughing. Even whistling and singing may be observed phenomena which are inexplicable and unforgiveable to distraught relatives [19]

Although this type of behaviour is natural among young people working closely together joking and laughing can be used to relieve tension and is a way of maintaining a tolerable climate within the unit.

In summary the literature review very clearly showed that excessive stress directly detrimentally effects the quality of nursing care delivered. It also suggests that nursing management should display a leadership style that decreases the probability of burnout and increases job satisfaction. This might be done by improving staff communication and fostering staff involvement in the governing of the unit. Consistent professional support might enhance the ability of ICU nurses to meet the increasing demands in this speciality and maintain their enthusiasm and job satisfaction. Intensive care units need to have a large core of stable, permanent workers who radiate enthusiasm towards new learners otherwise units muddle along at the expense of agency nurses and troubled third year students [16].

METHODOLOGY

The questionnaire was constructed following a literature search and examined each respondent's experience as a serving QARNNS/RN ICU nurse. Part time staff were omitted from this survey. Perception of non work related stress and 24 external work related stressors were analysed alongside experience and qualifications.

The pilot study carried out at RNH Stonehouse revealed a 92% response rate of returned questionnaires. Furthermore all sections of the questionnaire had been completed demonstrating that no ambiguity existed in the questioning method. This enabled not only a comparison between external stressors on similar units but also a much broader insight into Naval ICUs.

Primary data was coded then entered onto a spreadsheet for analysis and for ease of cross-referencing and scoring. Factual analysis of each unit was carried out separately and pie charts/bar charts drawn up. A table showing the top ten stressors was then constructed (*Table 1* RNH Stonehouse *Table 2* RNH Haslar). A comparison of external stressors was made and a further table constructed (*Table 3*).

Finally correlation of results between RGNs and ENGs was tested on the data from Haslar. A non parametric test Spearmans Rank Order Correlation was used (*Table 4*). The result demonstrates a positive correlation [18].

DISCUSSION

The purpose of this research was two fold. firstly to examine whether high levels of stress existed amongst nurses on the intensive care units at the Royal Naval Hospitals Stonehouse and Haslar and secondly to explore how to implement a strategy to minimise the effects of high levels of external stressors on the nursing staff if these were seen to be problematic. It can be assumed that poor management of stress results in poor nursing care, job dissatisfaction and diminished potential for further professional development. The literature review highlighted this aspect.

This survey has thrown some light on the stressors that may be encountered on the two units analysed. From the *health education* viewpoint it has confirmed that high levels of stress are perceived on an individual basis. What one nurse finds as stressful a second may not. Although at times extremely stressful critical care nursing is not all negative. Certain areas were found to be sources of both positive stress and satisfaction. Helping a patient through what may well be his most life threatening experience requires a high level of nursing competence. In meeting these demands the nurse will recognise certain frustrations, anxieties and physical demands, but these are overwhelmed by the sense of accomplishment when the patient leaves the ICU on their way to a better standard of health and well being.

However some stressors were perceived as stressful by many nurses on both units. These need to be looked at more closely to enable managers to explore ways of either eliminating or learning how to deal with them (see *Table 1* for the top ten stressors).

CONFIDENTIAL QUESTIONNAIRE

Please tick the appropriate boxes and/or make short statements where requested

1 Are you male ☐ or female ☐

2 Length of time served in the QARNNS. Please specify years and months

3 Are you an RGN ☐ or ENC ☐

4 How many years/months have you worked as an Intensive Care nurse?

5 How long have you been in your present ICU post

6 Do you have any further nursing qualifications (e.g. ENB courses please specify)

7 Please circle the number that best describes your usual personality

0	1	2	3	4
never worries	rarely worries	sometimes worries	often worries	always worried

8 Using the scale below, please indicate the level of stress you are experiencing at present by placing the appropriate number in both boxes that you are currently experiencing in your

Non-Work situation ☐

Work situation ☐

0	1	2	3	4
No Stress	Slight Stress	Some Stress	Definite Stress	Severe Stress

9 The following work related stressors have been selected on the basis of a review of the literature. Using the same scale as above please indicate by placing the most appropriate Number in the space provided

a	Seriousness of patients condition
b	Heavy lifting
c	Lack of communication
d	Too much responsibility
e	Lack of reward
f	Noisy environment
g	Experience of encountering death
h	Technical advances
i	Shift rotation
j	Communication channels
k	Fear of making mistakes
l	Lack of authority
m	Nurse/nursing administration relationship
n	Dealing with distressed NOK
o	Exposure to death and dying
p	Nurse/doctor relationship
q	Feelings of inadequacy
r	Nurse/peer relationships
s	Crisis atmosphere
t	Frequent negative feedback
u	Inexperienced peers
v	Patient/nurse ratio
w	Complicated equipment

10 If you are experiencing stress at work is this stress affecting you

	YES	NO	SOMETIMES
work performance?	☐	☐	☐
Life outside work?	☐	☐	☐

11 Please list any support group items colleagues or support groups that you are in at your present location or near ☐

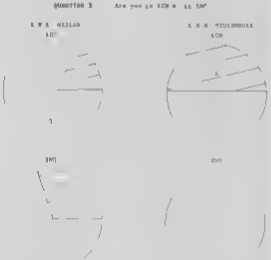
12 Is there any other person that you would approach for counselling if not GP?

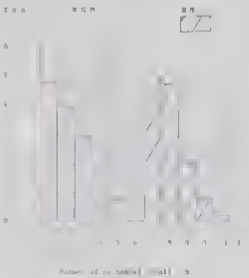
YES ☐

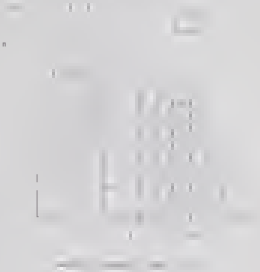
NO ☐

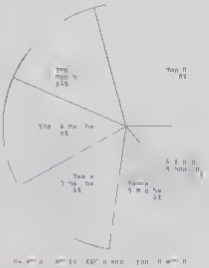
If YES please specify

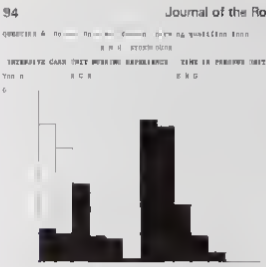
13 Are there any further comments that you wish to make?











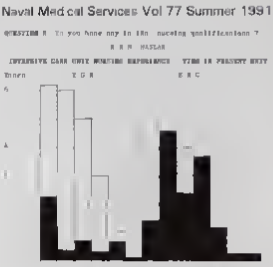


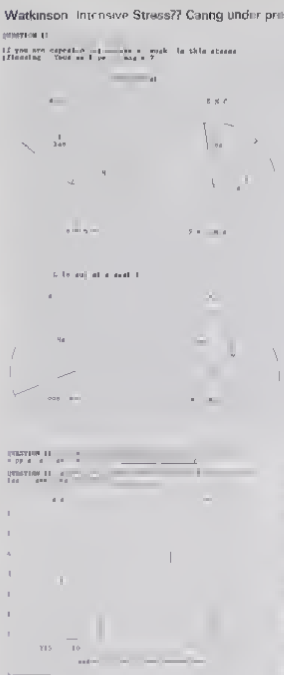
TABLE 3 CR TOCAL CAER UNITS A CORE [illegible] U RANK ORDERING OR MAJOR STRFOR'S

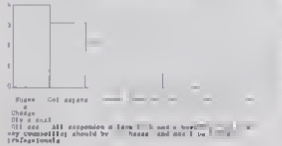
TABLE 2 R H H H HARLAR FCU
RONCEIVED INTENSITY OF MAJOR WORK RELATED STRESSORS

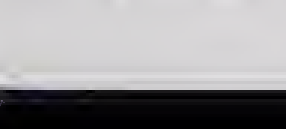
X [illegible] ors	M=as	R M	s
[illegible]			
[illegible]	2		
[illegible]	1		
[illegible]	3		
[illegible]			
[illegible]			
[illegible]	5		1
[illegible]	4	5	
[illegible]			7
[illegible]			

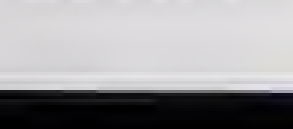
[illegible]ACT IN H

[illegible] [illegible] [illegible] [









Unless we understand that the manager's job is very complex we will fall into the trap of assuming that management is nothing more than common sense But common sense is common sense only when we know the important factors that affect the situation then we are able to understand what must be done [18]

The top four perceived ICU stressors at RNH Haslar are reviewed below in more detail each of these achieved a score above 2 4 on the stress scale Spearmans rank correlation coefficient demonstrates a small but nevertheless positive correlation between RGN and ENG stress perception The results offer some ideas on how external stressors can be managed to improve the effectiveness of care given to the critically ill patients

As Bishop[5] so rightly states there is no doubt that a greater awareness of the problems encountered is the first step to improving the standards for intensive care staff and ultimately for the patients

Working alongside inexperienced peers ranked as the major stress factor on both units I feel that I can only comment on the ICU at RNH Haslar during this period and hypothesise that similar reasons lie behind this major stressor in RNH Stonehouse In the rationale for carrying out this work it was stated that ICU nursing is centred around teamwork With the high turnover of staff during 1989 (86% RGNs and 50% ENGs) these fluctuations make team building and maintaining morale very difficult

The intensive care nursing staff has to function as a cohesive team the turmoil of staffing fluctuations does little to aid cohesiveness It only needs one experienced nurse to leave to produce a void that takes a minimum of two months to restore (the orientation package at RNH Haslar takes a minimum of two months to complete) The new member of staff should then have a basic level of competence Rarely were we in the fortunate position to double bank staff so to ease them into the specialty

The following recommendations may appear more idealistic than realistic However with the advent of Project 2000 and more recently the United Kingdom Central Council's Post Registration Education and Practice Project (PREPP) service commitments and those of our professional governing body may need to be more closely dovetailed together than ever before

The following is a proposed strategy that could be adopted and instigated as soon as staffing levels allow Intensive care trained nurses to work for a minimum of 18 months preferably two years in this specialty providing that they are happy to do so and this time to be spent on the same unit This would give a core of stability that is so desperately required Nurses without a recognised ICU qualification who have satisfactorily worked on the intensive care unit for 12 months who show enthusiasm and enjoy the work should have this fact recorded on the hospital computer and at central drafting/appointing At a time of disaster it would aid rapid recall of these nurses thus providing a pool of nurses with specialist skills to complement the intensive care staff (Most of the recent major disasters that have taken place in the UK have resulted in 10% of the casualties requiring the services of an intensive care unit.)

The nursing staff on our units daily practice skills that would be invaluable in time of war It is for this reason that I see no place for regular agency nurses on a military ICU

Frequent negative feedback was the second highest stressor in RNH Haslar but ranked ninth at RNH Stonehouse The reasons for this were varied Heavy workload resulting in staff having to hand over extra work to the next shift unrealistic expectations from some usually junior doctors who expect nurses to carry out multiple and often complex procedures immediately without adequate time for preparation of equipment or more importantly the patient

Fear of making mistakes ranked third overall but was the highest stressor for ENGs on both units Although at RNH Haslar in-service training along with the orientation package aims to equip the new staff member with basic ICU skills it can in no way hope to achieve what an ENB course in ICU nursing can It should be noted that only one ENG has an ICU qualification and he works at RNH Haslar However as we at Haslar provide some of the clinical facilities which enables Queen Alexandra Hospital at Cosham to run ENB 125 (General Intensive Care Nursing Course for RGNs) a strong case could be made for more QARNNS to be seconded (In 1989 only one nurse this has been increased to two on the 1990 91 course) Only one service nurse on the ICU at RNH Stonehouse had an ITU qualification at the time of this survey[1]

Lack of communication ranked fourth at Haslar but third overall Communication is a

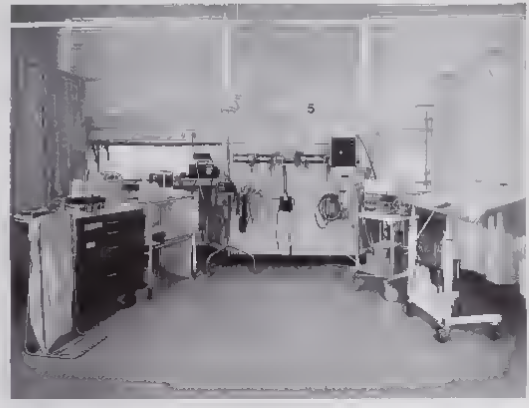


Fig 1 One of nine bed spaces on the refurbished ICU at Haslar

two-way process and can involve each and all of our senses Unfortunately this question should have been structured to be more specific This would have enabled a more precise evalnation. Regular unit meetings did take place but for the new member of staff a new vocabnlary has to be learnt. For example terms like Intermittent Positive Pressure Ventilation Extended Mandatory Minnte Volnme Bagging and Snck ing to name jnst a few So what was the problem at RNH Haslar? I snggest thnt the lack of communication was due primarily to the constant staffing fineinations Experienced regnlar staff may not always fnlly appreciate how newer members of staff feel and think The high turnover of staff during 1989 did not improve the snnation Qnite often it was easier to get on and do a task than taking time to give an explanation to the learner as to the why how what and when This is especially true when busy and of conrse does nothing to improve the learner s skills or confidence

Inter shift rivalry occasionally occnrred—comments like It s cot my fanlt, it's the other shift when a proceednre has not been performed or eqnipment gone astrav This is something that we as nnrses are all gnilty of doing at sometime By increasing the nnmber of nnit meetings which were of an open forum style and actively involving all staff in ideas for the refnrbishment of the ICU (B2 ward) we had a marvellons opportnnity to foster the team spirit as the nnit moved back in the early snmmer of 1990 Following fnrther discnssion with each member of the ICU nursing staff at Haslar a system of "mentorship was introduced Goal setting was negotiated between the mentor and new staff member development and integration into ICU was more closely monitored The orientation package provided a monitoring tool for goal setting In addition senior staff needed little enconragement to pnrsue conrses in teaching and assessing skills snch as the ENB 998 conrse Teaching and assessing in clinical praclice This conrse helped to bring about an imaginative creative and innovative approach to teaching on the nnit Having a contnnons throughpnt of ENB

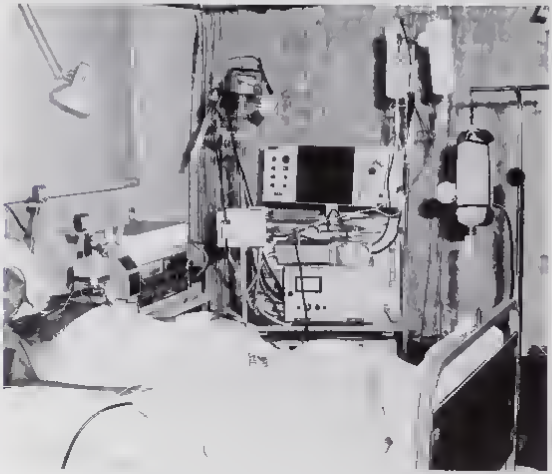


Fig 1 An intensive care patient receiving ventilatory and renal support

125 students kept the trained nursing staff and the anaesthetists on their toes

A series of regular Tuesday lunch time seminars given by doctors supplemented the formal ward teaching These were held during the handover period so that as many staff as possible could attend Educating nurses must be seen as a necessity and not an option thus time has to be made available for it—not always easily achieved especially when the ward is busy A very positive response resulted These seminars/lectures lasted 20 to 30 minutes followed by a time for questions The contents of these seminars needed to be repeated in a cyclical fashion due to the staff turnover and for the part time agency nurses Of course formal teaching is only part of the clinical learning process Much learning takes place incidentally through discussion demonstration observation and peer group meetings

When a new member of staff was to join the unit a joining letter along with the orientation programme and reading list was sent to them Most joiners found this helpful Informal visits were arranged where possible so as to reduce the fear of the unknown thereby reducing stress and improving the communication process

This review of the top four perceived ICU stressors at RNH Haslar in 1990 together with a suggestion of how some of these external stressors might be dealt with and managed was the result of this research Nursing requires knowledge to enable practitioners to perform their work with understanding To achieve this involves every nurse, both senior and junior to

contribute their unique experience for the good of the team

Respondents in both hospitals felt that they could cope with work related stress providing in house facilities existed for 'letting off steam' when required This may be with colleagues friends or family There were no suggestion for providing professional counsellors This is an interesting point as most of the American research suggested that this is essential to prevent burnout Referral to our own psychiatric department carries a certain amount of stigma possibly because staff would have to report sick to get an appointment This therefore precludes the element of confidentiality which research suggests is essential

EVALUATION

The choice of research method was largely dictated by the resources available or rather lack of them The practical limitations of being a single researcher without recognised funds or time meant that I was only able to conduct a small survey This does however provide a snapshot of these units at the time the survey was conducted

In using the questionnaire as opposed to the interview method I was able to involve RNH Stonehouse in the sample of intensive care nurses This method was both inexpensive in time and funds Its success however depends heavily on the design of the questionnaire and I am indebted to Ms Sne Davies for allowing me to lean heavily on the work she carried out in the Portsmouth District Mental Health Service in 1989

This research has raised some important specific issues that cannot easily be dismissed or ignored Those of us in a position to ensure that we use our most vital resource properly by nurturing the nurse so that he or she can get on with the nursing

ACKNOWLEDGEMENTS

I would like to thank all the nursing staff of both ICUs for their help and honesty in completing the questionnaires Mr John Hill Statistician at the Department of Community Services Highburv College of Technology Portsmouth for his help and advice and the following for their interest and encouragement Surgeon Commander A Yates Royal Navy Consultant Anaesthetist Head of ICU at RNH Haslar 1989–90 and Superintending Nursing Officer J Beach QARNNS Psychiatric nurse specialist

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ROYAL NAVAL HOSPITAL GREAT YARMOUTH

It has been brought to our attention by Surgeon Captain R W Duncan Royal Navy that the former Royal Naval Hospital Great Yarmouth (now St Nicholas Hospital) which was the Royal Navy's main psychiatric unit during the Second World War and has continued in use as a psychiatric hospital under the NHS until now is presently under threat of closure and subsequent demolition. Surgeon Captain Duncan has been asked by the Great Yarmouth branch of the Royal Naval Association of which he is President to find out what he can about the background and history of this hospital.

Anyone with information which they feel might be helpful to Surgeon Captain Duncan is requested to write to him at the following address:

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Trans-endoscopic balloon dilatation of benign oesophageal strictures: A prospective study as an out-patient procedure

W P Joyce, A J Walker and M Rees

Abstract

Over an 18 month period 70 consecutive patients underwent 100 oesophageal balloon dilatations of their benign peptic strictures by the trans endoscopic route. All procedures were performed as an out patient under intravenous sedation. One patient developed respiratory depression from over sedation. No other complications were seen in the series. The first 50 patients were reviewed by postal questionnaire. The majority (91%) of patients were swallowing normally and all patients except one were happy with the procedure and content to undergo further dilatation should it prove necessary. A cost analysis was performed comparing balloon dilatation with conventional bougienage which is also practised at our hospital. Balloon dilatation as an out patient procedure is a more cost effective technique when compared to bougienage and has the potential of saving the health service many thousands of pounds per annum.

INTRODUCTION

Benign oesophageal peptic stricture is a common condition in the elderly population. Conventional methods of conservative management usually involve bougienage with metal olive or mercury weighted dilators[1,2] and are not without risk.[3] These dilators are pushed downwards through the stricture, directing the applied forces through a longitudinal axis, thereby running the risk of perforation. Most centres therefore admit patients overnight and some still use a general anaesthetic.

Trans endoscopic balloon dilatation applies a controlled and radially directed dilating force. As the dilating forces applied are radially directed there is less risk of perforation. This has the theoretical advantage of being a safer method[4] while being as effective as conventional bougienage.[5] We report a consecutive series of 100 dilatations in 70 patients treated by trans-endoscopic balloon dilatation as an out patient procedure and comment on its efficiency, safety and cost effectiveness.

PATIENTS AND METHODS

Over an 18 month period 70 consecutive patients with benign peptic strictures were treated by trans-endoscopic balloon dilatation. Thirty eight patients were female and 32 male, ages ranged from 38–91 (mean 71 yrs). Under intravenous sedation (2–10 mg midazolam and 25–100 mg pethidine) the dilatation was performed under endoscopic vision without X-ray imaging, using a Rigiflex TTS balloon catheter (KeyMed Essex). All strictures dilated were situated in the mid or lower oesophagus. Once the stricture was passed the balloon was inflated with water to a pressure of 25–75 psi (depending on balloon size) and maintained inflated for a minimum duration of 10 seconds. Upon recovery the patients were allowed free

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fluids and were all discharged home the same day

RESULTS

Forty-seven patients (67%) underwent a single dilatation eight patients (11%) required two dilatations and 15 patients (21%) required more than three dilatations to relieve symptoms All patients tolerated the procedure well and had immediate symptomatic relief One patient developed respiratory depression from over sedation which was easily reversed by the intravenous administration of a narcotic antagonist There were no other complications associated with the procedure

A review of the outcome of the first 50 patients was undertaken by a postal questionnaire This revealed that five patients had died of unrelated causes Of the survivors 41 (91%) patients considered that their ability to swallow had improved so markedly that they did not require further dilatation when offered this Of the four patients having problems all had requested and are undergoing further dilatation Only one patient was unhappy with the procedure describing it as lengthy and unpleasant The other 44 were happy to undergo further dilatation should it prove necessary

COST ANALYSIS

A cost analysis was performed comparing this form of treatment to conventional bougienage which is also practised at our hospital Conventional bougienage as practised at our hospital involves the use of either Eder Puestow or Maloney type mercury-weighted dilators A gross saving of £156 52 per patient was found in patients treated by balloon dilatation (*Table* 1) This includes both fixed costs (staff endoscopy equipment etc) and variable costs (catheters local anaesthetic syringes etc) Bougienage patients all had a general anaesthetic a post-dilatation chest X-ray and had on average a 2 5 bed day occupancy rate All patients having balloon dilatation were treated as an out patient

DISCUSSION

Fibre optic endoscopic dilatation of benign oesophageal strictures was first introduced in the early 1970s[4] and has since gained widespread acceptance as the treatment of choice in the management of this condition Balloon dilatation of benign peptic strictures has recently gained favour and only one pilot study to date[5] has compared its efficacy and safety with conventional bougienage This study suggested that balloon dilatation is as effective as conventional bougienage in the relief of symptoms and may also be a safer technique However no study has yet addressed the important question of the cost-effectiveness of both techniques

Our data suggests that oesophageal balloon dilatation of benign peptic strictures is a safe and well tolerated procedure These results also suggest that it is effective in the relief of symptoms and that follow up recurrence rates compare favourably with other forms of bougienage It can be performed as an out patient and is cost effective when compared with conventional bougienage

In conclusion oesophageal balloon dilatation by the trans-endoscopic route is an effective out patient method of managing a common condition in an elderly population The risks and costs associated with general anaesthesia and

Table 1 Fixed and variable costs of balloon dilatation versus bougienage under general anaesthetic at our institution

Balloon dilatation	Per patient	100 cases per year
Variable costs	£6 17	£617 00
Fixed costs	£97 55	£9,755 00
	£103 72	£10 372 00
Bougienage	**Per patient**	**100 cases per year**
Variable costs	£16 36	£1 636 00
Fixed costs	£243 88	£24,000 00
	£260 24	£26 024 00

Gross saving of £156 00 per patient or £15 652 00 per 100 cases

X ray imaging are not incurred and the majority of patients can be successfully managed by one dilatation only. Should further dilatation be necessary this is generally well tolerated by patients. Balloon dilatation is cost effective when compared with other methods of bougienage and we therefore recommend that trans-endoscopic balloon dilatation is the treatment of choice for benign oesophageal peptic stricture in this patient population.

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The role of pulmonary angiography in the investigation of suspected pulmonary embolism

P J. Buxton

INTRODUCTION

The accurate diagnosis of pulmonary embolism (PE) is important since there is an appreciable morbidity associated with anticoagulant therapy and the failure to treat an established PE may also have grave consequences. A radionuclide lung ventilation and perfusion study is a simple non invasive investigation although in a significant number of cases the result is equivocal and no firm conclusion can be drawn on the presence or absence of a PE. Two patients with equivocal VQ scans are presented in which pulmonary angiography was helpful in determining the correct diagnosis.

METHODS OF INVESTIGATING SUSPECTED PULMONARY EMBOLUS

A suspected pulmonary embolus is best investigated initially with a radionuclide ventilation and perfusion scan. Perfusion is assessed by injecting 100 MBq of ^{99m}Tc labelled albumin microspheres into a peripheral vein. Ventilation is assessed using the radioactive gas Krypton which has a very short half life. A classical embolus produces a pattern of normal ventilation and decreased perfusion. In the cases where the appearance is equivocal pulmonary angiography may be used to establish a definitive diagnosis.

Pulmonary angiography is performed with a combination of fluroscopy and rapid cut films. The patient should have continuous ECG monitoring and there should be the facility to measure the ventricular pressure through the catheter. Under local anaesthesia a catheter is inserted into the superficial femoral vein and advanced to the inferior vena cava. Contrast is injected to check that the IVC is patent and free from thrombus. The catheter is then advanced to the heart and manipulated through the tricuspid valve. The right ventricular end dia

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Fig. 1(a). Lung perfusion image (Tc labelled albumin microspheres) of case 1 showing right upper lobe perfusion defect (arrowed).

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Fig. 1b. Lung ventilation image (Kr gas) of case 1 showing uniform ventilation

stolic pressure is measured and the procedure is abandoned if this exceeds 20 mmHg. Separate injections are then made into the left and right pulmonary arteries and selective injections into any segmental arteries that appear suspicious. Particular attention is paid to those areas which have been shown to be abnormal on VQ scanning. The procedure is straightforward, does not cause undue discomfort and is relatively risk free.

CASE REPORTS

Case 1

A 44-year old man with a history of relapsing polychondritis presented with chest pain. A VQ scan showed a small area of diffuse loss of perfusion in the right upper lobe with normal ventilation (*Figs. 1a and 1b*). The appearance was considered to be that of a resolving PE. The diagnosis was not considered to be sufficiently certain, however, to commence anticoagulant therapy, and a pulmonary angiogram was performed for confirmation.

Injection of contrast into the right pulmonary

Fig. 2. Right pulmonary artery angiogram of case 1 (early film) showing area of decreased peripheral vessel filling (arrows).

Fig. 3. Right pulmonary artery angiogram of case 1 (late film) showing pulmonary veins and late filling of a pulmonary artery (arrow).

Fig. 4 Selective right upper lobe angiogram showing thrombus within the artery shown in Fig. 3

Fig. 5(a) Lung perfusion image (Tc labelled macroaggregates) of case 2 showing left upper lobe perfusion defect (arrowed)

Fig. 5(b) Lung ventilation image (krypton gas) of case 2 showing uniform ventilation

artery showed a defect in peripheral vessel filling in the right upper lobe (*Fig. 2*) and late filling of an upper lobe artery (*Fig. 3*) but no intravascular filling defects were seen. The site of the defect corresponded to the VQ scan abnormality and selective catheterisation of the right upper lobe artery was therefore performed. This showed embolus within the artery which had delayed filling on the flush injection (*Fig. 4*). The patient was anticoagulated and made a satisfactory recovery.

Case 2

A 49 year old man presented to casualty complaining of chest pain which he described as being similar to that which he had experienced two years previously when a PE had been diagnosed on VQ scan. The possibility of a further PE was considered and a VQ scan was performed. This showed diffuse loss of perfusion in the left upper lobe with normal ventilation (*Figs 5a and 5b*). The appearance was considered to be equivocal and in view of his previous history an angiogram was performed.

Injections were made into the right and left pulmonary arteries (*Fig. 6*). No intravascular filling defects were seen nor was there any abnormality of peripheral vessel filling. There was therefore no evidence of a PE and the patient was discharged. He had no further follow-up appointment but had no further episodes of pain.

DISCUSSION

The investigation of patients with a suspected PE who have an equivocal VQ scan is controversial. Practice in this country varies from that

Fig 4 Left pulmonary arteriogram of case 4 showing normal perfusion with evidence of pulmonary emboli

in the United States where there is a greater willingness to proceed to angiography in equivocal cases[1] Although pulmonary angiography is generally a safe procedure it would be inappropriate to subject all patients with an equivocal VQ scan to such an invasive procedure

The cases presented illustrate that pulmonary angiography can in certain circumstances provide useful additional information which allows correct treatment to be instituted Injections into the main pulmonary arteries however may fail to show the emboli and in these cases a VQ scan may direct the angiographer to the appropriate artery for selective catheterisation Pulmonary angiography and VQ scanning are therefore complementary tests

The risks and benefits of angiography should be weighed against the risks of inappropriate anticoagulant therapy in all cases where the VQ scan is equivocal

ACKNOWLEDGEMENT

I wish to thank Prof D M Ackery for his help in the preparation of this paper

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Fair Dinkum Way-out Woop-Woop: the Sydney to Darwin Motor Safari 1990. Part 1

P H Hardy

INTRODUCTION

Being on exchange duties with the Royal Australian Navy provides many opportunities One such opportunity is the Australian Safari a motorcycle and car race between Sydney and Darwin which travels some 6 500 km through the rugged Australian Outback over an eight day period

Through my exchange duties I was fortunate to become involved with the Safari for the 1989 race and was delighted to be asked to take over the organisation and running of the medical aspects of the event as the Honorary Chief Medical Officer in 1990

This article covers some of the background to the preparation and conduct of the 1990 Safari and provides an overview of some of the medical incidents experienced In the winter 1991 issue of this Journal I shall provide a little more flavour for the event by reviewing an average day s activities and some particularly memorable events encountered as we raced across Australia

THE AUSTRALIAN RAID

The Safari is classified in accordance with the international motorsport regulatory bodies as a raid As such it bears many similarities to the Paris–Dakkar event However with this vast continent being so large that the whole of Europe could fit within its shores (save a little of Ireland Norway and Greece) the Sydney to Darwin Safari has the additional attraction that no international boundaries need be crossed, the whole of the event being run in one country

Without doubt the greatest attraction for the international field is the course itself Firstly we would be crossing some of Australia s most gruelling but beautiful outback In this arid country the rolling sand-dunes of the Red Centre would be a challenge as would the flat open expanses of the Tanami Desert There would be river crossings too dry or wet shallow or deep narrow or wide Whilst the crocodiles would provide additional interest during the river crossings the ever present emus and kangaroos of the grasslands would be a natural if unpredictable moving hazard for the competitors

Then there would be the climate Initially it would be cold with dense night frosts as we left Sydney in the winter to head for the Blue Mountains then northwards to the heat and humidity of tropical Darwin All these rapid changes would be experienced over the brief but action packed eight days of the raid

Each day the race is split into a number of competitive and transport sections Run through sheep stations and remote Outback, a competitive section may be 3–30 km long We would average approximately 800 km of travel per day at speeds of up to 160 km/hr On reaching Darwin some 6 500 km of timed racing would have been experienced

As the rally passes through some of the most remote parts of Australia the overnight camps

Surgeon Lieutenant Commander Hardy is currently appointed to HMAS *Platypus* on exchange duties with the Royal Australian Navy

[illegible] the bush. The racing motorcycles and cars pass via a longer and more torturous course when compared to the Safari support vehicles which travel a shorter direct route between night stops. This enables the support crews to pitch camp before the first competitor arrives on completion of the day's racing. The race support is comprehensive each night a tent city is erected. Welding, tyre repair, race administration, scrutineering, media facilities and of course medical care are some of the services conducted from under canvas or from the rear of trucks. Our caterers took all of our food supplies but such creature comforts as hot water and flushing loos are left behind in Sydney. With some 750–800 personnel under canvas the accommodation tents occupied a sizeable area (and locating your own tent when sleep deprived and in the darkness of early morning could be an adventure in its own right)!

The event generates a great team spirit. Even when racing, there remains a good deal of gentlemanliness as competitors stop to render assistance to other vehicles broken down with mechanical failure, bogged in mud or buried in sand. The spirit of the raid is equally evident at each night's stopover as damage control exercises are attempted on vehicles which have failed to withstand the rigours of the rugged terrain.

This exped-type team spirit is carried over into the medical aspects of the Safari with the chance to develop and refine those clinical skills not to be found in hospitals but so desirable onboard a ship: resuscitation and first aid care of a patient when medical backup is well over the horizon, the need to make a clinical decision without laboratory support, to triage, plan and organise medical evacuation of the injured, the liaise with the command/race organiser regarding the injured. With each stopover tending to be many kilometres from population centres, our emergency daytime medical care developed into a General Practice at each evening camp. However, before any of this there is the preparation for the event itself.

PREPARATION AND MEDICAL SUPPORT

In preparing the medical cover for the event a number of aspects must be considered. Firstly, vehicles, ie helicopter, ambulance and sweeps. Then there is the medical tent facility at each night's stopover, then staff recruitment and, lastly, pharmaceuticals and other equipment.

Helicopter

This is an expensive item for the organisers of the Safari to sponsor. However, it is also a vital one for with the leading vehicles reaching speeds in excess of 160 km/hr there is no other realistic way of keeping pace with the front runners. In order to obtain the best value for money from the helicopter, it also acts as a video camera platform for film work. This is to everyone's advantage. The organisers profit by squeezing two services from one expensive outlay, the video cameraman is happy as he has the opportunity of keeping up with the leaders which is often where much of the newsworthy action takes place. The doctor carried on board is pleased as he has superb aerial views of the Safari as the helicopter chases the mud vehicles at high speed and low level across the Outback and the competitors are satisfied in the knowledge that in the sky a flying doctor is ever on call to respond to a cry for help.

When medical events occur a radio message is transmitted to the helicopter. Dependant upon the casualty's condition the film crew and navigator/course director are dropped from the aircraft and a stretcher rigged inside. The casualty is then evacuated with a medical officer in attendance. Whilst the helicopter can land adjacent to the track to collect the injured, it can only cruise at 120 knots. In addition its endurance is not great. To overcome these problems the Safari is able to call upon its fixed wing assets. These additional aircraft are principally used as flying radio relay stations circling at 5 000 ft over the rally's planned route. However, when needed they can drop down onto a sheep stations's landing strip (all stations have these for the use of the Flying Doctor Service or simply as a means of negotiating the vastness of the continent) to collect a patient who has been lifted out of the race by helicopter. With the faster cruising speed and longer endurance of the fixed wing aircraft a three-hour response time from way Outback to major health facilities was not unusual in 1990.

Ambulance

This is a four wheel-drive van specially prepared and modified for the event. To withstand the rigours of the course, the suspension has been heightened and strengthened and sump guards fitted. Two radios are installed for communication and of course the compulsory (and essential) bull or roo bar is to be found on the front. Medically it has been equipped

with two stretchers oxygen supplies a small refrigerator and boxes of medical kit (eg chest drains, cervical collars, inflatable splints I/V fluids etc)

Fig. 1 The author with the Safari ambulance.

The tasking of the ambulance throughout the day is that of an in field mobile medical centre Before dawn it sets off to get well into the day s course before the first competitor leaves camp at first light. An early start is guaranteed for the doctor but fortunately his seat reclines his safety harness is secure and the noise and motion of the vehicle are soporific! Once the day s racing is underway the ambulance tends to sprint into the field almost joining in with the competitors Travelling at speeds approximating those of the raid vehicles the ambulance covers the track in short bursts In this way medical care is provided for the first half of the Safari vehicles

Fig. 2 A typical Safari competition vehicle. This one belonged to PO C [illegible] O Grady from HMAS *Platypus* ships compa[illegible]

'Sweep' vehicles

These are so-called as they are the last official vehicles through the race s courses They are large four wheel drive Toyota Landcruisers and act as mobile first aid posts as well as performing a variety of race administration/marshall duties for the latter half of the field. Although they carry a doctor their principal role is to pick up stragglers and cater for the walking wounded Invariably as the competitors tire as the event progresses the sweep vehicles end up following exhausted motorcyclists at a painfully slow pace through the course and in the dark Often the last sweep may not pull into the night camp until 02 00 which makes for a long day after a 06 00 start

With all official vehicles carrying radios and many of the competitors also being on the air medical resources are rapidly tasked to cater for medical incidents throughout the field the course director being in overall control of tasking individual medical units Towards the end of the day s racing the leading and trailing vehicles can be separated by up to 300 km which inevitably means that medical assets are thinly spread. In practise however the helicopter ambulance and two sweep vehicles provided satisfactory medical cover in 1990

Medical tent

This is the last level of medical cover provided by the Safari Managing mainly A and E type injuries (with a fair smattering of General Practice problems) the tent provides care for the Safari at each of the night stops which are often in the middle of nowhere By the time the competitors, race marshalls scrutineers time keepers, domestic services tyre and welding trucks are included, the medical team is responsible for some 800 people Welding in the field, repairing tyres on uneven ground and even general car maintenance by the light of a single torch can be hazardous and the injuries which present are often a direct consequence of this somewhat unusual working environment

Unfortunately we do not carry X ray facilities and sterilisation is basic However the raid population is highly motivated to continue the Safari and on most days the course would pass within 80 km of a cottage type hospital where equipment could be borrowed An alternative would be to take the nearest main road to the health facility within striking distance of the night's stopover This might entail a four hour drive there and a four hour drive back with the

Table 1 The Sydney to Darwin Motor Safari 1990—Daily Stages

Sat 18 August	Sydney–Nyngan (via Blue Mountains)
Sun 19 August	Nyngan–Silverton (near Broken Hill)
Mon 20 August	Silverton–Maree (via Flinders Ranges)
Tue 21 August	Maree–Mariah (via Oodnadatta)
Wed 22 August	Mariah–Ayers Rock (via Kulgera)
Thur 12 August	Ayers Rock–Alice Springs (via Macdonnell Ranges)
Fri 24 August	Alice Springs–Tennant Creek (via Devil's Marbles)
Sat 25 August	Tanant Creek–Katherine (via Tanami Desert)
Sun 26 August	Katherine–Darwin (via Daly River)

additional risk of missing the start the following day. If at all feasible patients would wait for Alice Springs and Darwin to be reached.

Staffing

As Chief Medical Officer one is responsible for recruiting staff. All support personnel offer their services on a voluntary basis. However with this opportunity of exploring the Australian Outback, few people need much in the way of encouragement to commit themselves to the raid. Hence the four doctors, four nurses and two physiotherapists for the 1990 event were soon identified. Having ensured that the helicopter, ambulance and sweep vehicles are up to the required medical task, the final responsibility is the medical stores and doctor's back packs.

Medical equipment

Each doctor takes with him at all times a backpack of medical equipment. Supplying the doctors with these packs before the event permits each medical officer to add or subtract specific items to cater for individual preferences. The basics are provided for in the form of simple analgesics and dressings plus diagnostic equipment such as sphygmomanometers and ophthalmoscopes. More significant medical conditions are covered by the inclusion of intubation gear, oxygen administration equipment, I/V fluids, narcotics etc. A full range of medications is obtained through approaching the pharmaceutical industry who are more than happy to see their products promoted in this international event by making generous donation of specified drugs requested from their marketing managers. In addition each vehicle carries further medical supplies (eg. stretchers and splints). These items provide comprehensive resources for in field care but realistically how much can be achieved by the doctor placed in a sand-blown desert at midday is open to debate. The medical policy which works well is to stabilise with First Aid and seek rapid evacuation. Indeed this policy has been adopted and developed for the 1991 event which promises to attract an even larger entry. As such current planning already includes two helicopters and two in-field ambulances.

SIGNIFICANT MEDICAL INJURIES

A review of the injuries sustained as 750 people raced across 6 500 km of Outback Australia gives some insight into the Safari itself. It also shows that the current international Safari regulation regarding safety equipment in motor sport are obviously effective. In the 1990 event, we treated only 11 significant injuries. Of these, one incidents involved motorcyclists. The only vehicle injuries occurred in a car carrying some press reporters which rolled whilst following the Safari route. We were fortunate in 1990 as over the past six years while the event has been running there has been at least one injury causing quadraplegia and one causing death. This year significant medical incidents were:

a. Two motorcycle riders who were evacuated to regional hospitals for assessment and ongoing care. Both these riders sustained crushed vertebra after falling from their machines at speed. Both made uneventful recoveries.

b. Three casualties requiring overnight observation in regional medical centres for head injury and soft tissue facial injuries. They were able to subsequently rejoin the raid as observers. The compulsory wearing of crash helmets in all vehicles on Safari should be considered as two of these casualties were in the media vehicle which rolled over.

c. Three casualties who were treated by Safari medical officers but using the facilities of the local Royal Flying Doctor Service. Two required X-ray examination for a Colles's fracture and a dislocated

shoulder respectively One required the suture of facial lacerations under antiseptic conditions and good light

d Lastly three riders who were treated on course or within the resources of the medical tent These were a head injury a subluxed Acromio Clavicular joint and a fractured metacarpal Further follow up of these injuries was performed as facilities permitted.

Perhaps this small proportion of significant medical problems is a tribute to the resilience of the human body as approximately half of the starting competitors failed to reach Darwin due to the development of mechanical defects.

Of course there was a variety of illnesses and minor medical problems treated on our trip to Darwin. An upper respiratory tract infection travelled with us causing some consternation as supplies of paracetamol dwindled and business was brisk as splinters were removed from fingers The request for a free second opinion on a condition present for many months was also a favourite presenting complaint

Consideration has been given to the Australian Motor Safari concentrating on the medical preparation and some of the injuries sustained in 1990 The concluding article in the next journal will review an average day s activities and some personal memories from the 1990 event

Queen Alexandra's Royal Naval Nursing Service

Kathleen Harland MA

This book was commissioned to be written by Kathleen Harland for the QARNNS Centenary celebrations in 1984. The high cost of publishing and corresponding lack of funds put the project into abeyance until it was brought to the attention of the Editorial Committee of the Journal of the Royal Naval Medical Service. Only through the financial backing of the JRNMS who have acted as publishers has it been possible to print the book.

Mrs Harland has written a comprehensive account of the History of QARNNS from their inception in 1884 up until 1998. It is a book which combines history, general interest and some anecdotes in an easy to read style. She relates the initial antipathy to females being attached to the Royal Navy, the conditions under which some QARNNS Officers served in WW2 and describes the trials of service during the Korean War and latterly the effect of the Falklands War. The book will be of interest to historians in particular the comprehensive tables at the back of the book which cover a diversity of subjects including Honours and Awards and Establishments where QARNNS Officers have served. A wide selection of photographs provide contrast and further interest for those people who may prefer just to browse through the pages.

The book costs £8.50 which includes postage. For those who can collect direct from the Office of Surgeon Commodore (NMT) the cost will be £7.50. To order a copy of the book you are requested to complete the form below and send to: ISTO, Office of Surgeon Commodore (NMT), Monekton House, Institute of Naval Medicine, Alverstoke, Gosport, Hants PO12 2DL.

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Increase in subscription rates

In view of continuing increases in printing and postal costs and, in addition the reduction in interest rates the Editorial Committee has been advised by the auditors that an increase in subscription is necessary to maintain the continued good health of the Journal Fund It has therefore reluctantly been decided to increase the annual subscription from the present £8 00 a year to **£12·00 a year with effect from 1 January 1992** This increase will not effect those subscribers who currently pay the reduced subscription of £5 00 it has however been agreed that those subscribers who qualify both on age and loyalty to the Journal after **1 January 1992** shall be entitled to a **reduced subscription of £9·00 a year**

Subscribers are therefore invited to complete the attached proforma and return it to the Journal Office if possible by **the end of October 1991**

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J roy nav med Serv 1991 77 119–121

The Cruel Field

R M C McNeill Love

Based on an article originally published in the Royal Green Jacket Regiment

As a Royal Navy General Practitioner in Gibraltar I worked with the Navy for four months and with the Army for about a year Apart from Fortress Headquarters and the Gibraltar Regiment the bulk of my work was with the resident battalion Consequently I had the always stimulating, usually surprising, often exhilarating, occasionally exploding privilege of being the Royal Naval Regimental Medical Officer to the 3rd Battalion the Royal Green Jackets (3 RGJ), one of the more unusual roles that a career in HM Forces in the 1990s might ask of someone This short article is to record some of the impressions of the Battalion that I received and indeed will not forget

I awoke on 16 January 1990 after a sleepless night and thought Well Robin this is it—the moment has come Feeling a little like David Livingstone must have felt as he plunged into the unknown I set off for the Garrison Medical Centre to become Garrison Medical Officer to a strange world—the British Army

As I entered my Medical Centre which unfortunately did not resemble the Mayo Clinic—it was built in 1969 for a temporary facility and was in fact still standing, just!—I was greeted with a smart salute and cup of coffee by the 3 RGJ Medical Sergeant I was beginning to feel a little more relaxed until I was shown the Sick Parade list which appeared to resemble the Nominal Roll for the London Borough of Brent! Calling each patient to by pressing a bell a practice which although not exactly personal to the patient is certain preserving for the doctor I was immediately impressed by the spectacle of smart soldiers marching into my office and saluting— was this just because I was in the Senior Service or do all Army officers get this treatment? However as soon as I began to feel a little more confident in finding my feet, I would be presented with a new unknown for example to the innocent enquiry How are you feeling? the reply might be 'Great durch' ('Durch' being a unique 3 RGJ term which is added to the premier word to completely reverse its meaning) I was also a little amazed to discover that having asked a Rifleman to drop his trousers in order to examine his knees I would look up after writing some notes to find him standing naked from the waist down another delightful little 3 RGJ trait is to wear no underpants a habit that I have certainly not aspired to Nevertheless the sick parade was well organised and the Medical Sergeant and Regimental Medical Assistants most helpful After the enormous list of people on sick parade I then commenced the families clinic and met the RGJ supporters club the all important wives and children who in turn were welcoming and obviously slightly bemused that yet again another Royal Naval doctor had been assigned to them

As the day wore on I continued my crash course into the Greenjackets At short notice I had to learn what enfolded the chain of command and how the fact that I ultimately answered to an admiral fitted me into the structure I heard for the first time voices down the phone declaring that they were OC 1 Company RQMS TQMS Adjutant CSM

At the time of writing, Surgeon Lieutenant Commander McNeill Love was Regimental Medical Officer to the 3rd Battalion Royal Green Jackets in Gibraltar He is presently appointed to Princess Mary's RAF Hospital Halton

OM [illegible] Hong Kong [illegible] Brigade Interpreters was endless and my learning curve vertical Nevertheless as my first day ended and I climbed into my Army Metro to return home I must admit that although exhausted I had actually enjoyed my first contact with the British army and that night I slept peacefully and deeply

Over the next few days I made calls on my new Army bosses and was again astonished when I was introduced to Colonel Peter—in reality Lieutenant Colonel P D Brown MBE In the Royal Navy to call one's commanding officer Captain Bob or whatever would be immediately followed by a psychiatric consultation and probable Court Martial for insubordination I am afraid that nine years of Royal Naval service has ingrained in me that Sir is the Pavlovian response and thankfully I had not completely unlearnt this when I returned to my dark blue employer I met the Second in Command and having informed him that in the Royal Navy we call the 2IC the Jimmy he looked horrified and said 'You shall not call me the Jimmy perhaps the James' I was however deeply impressed by the warmth and sincerity of my welcome and the degree to which I was urged to feel at home with the 3 RGJ

As the days melted into months and I gradually found my feet I increasingly enjoyed working with 3 RGJ and indeed the British army as a whole Of some statistical note is that the Garrison Medical Centre under my charge looked after approximately 736 Army personnel 349 wives and 452 children My staff included on average one Practice Manager—a 3 RGJ Medical Sergeant—and three Regimental Medical Assistants—two NCOs and a Rifleman There was also a Gibraltar Regiment Medical Sergeant and of course a Practice Sister a SSAFA Health Visitor and civilian administrative and clerical staff We worked in close cooperation with the Royal Naval Hospital Gibraltar which included Obstetrics for when the 3 RGJ storks flew and indeed with other Naval and RAF Families Clinics in Gibraltar

Mess life at 3 RGJ was of a consistently high quality Of interest is that there are no Mess rules as the Colonel expects his men to behave as the gentlemen they are supposed to be There are no after dinner speeches which as a Naval officer I have to admit I missed The Loyal Toast is not drunk as the officers loyalty is undoubted but personally a good dignified Naval toast of The Queen is to mean an outward showing of loyalty which is of course equally undisputed I have been to many Mess dinners—some with my wife—and at every occasion we have been tremendously impressed in all respects with 3 RGJ hospitality

Undoubtedly the highlight of my year with the Battalion was to accompany them to STANTA training area in Thetford Norfolk as their RMO in October 1990 As I sat in my business class seat on the flight from Gibraltar to Gatwick enjoying good food and champagne I looked around at my fellow passengers and wondered how many of them had a cold Norfolk ditch as their destination I drank some more champagne and tried to pretend with dignity that I was heading for the London Hilton I arrived at Gatwick to find that the 3 RGJ driver sent to meet me had apparently gone to the wrong terminal so I heaved my luggage which contained a few unusual items (a helmet in my suitcase and mess tins in my briefcase) onto the Gatwick Express and set off for Thetford by train

I arrived at Wretham Camp and looked aghast at the huts—this was worse than anything I had imagined and I was relieved to discover that for the first two nights or so we would be in camp as part of Echelon I met the Officer Commanding Echelon and at about 01 00 went to bed and slept soundly until about 05 30 when joined only by neurotic maniac crowing cockerels we were all invited to arise and taking mess tins had breakfast Having met up with my medical team we started the first clinic of sickeys and then headed off in our little convoy of mercy to visit the Companies in the field

As typical of the Royal Navy and I discovered no less so of the Royal Green Jackets the humour of Her Majesty's men when under taxing conditions is second to none but unfortunately not printable in a Journal such as this It was again another new experience my consulting room a forest my examining couch a floor of bracken my dispensary a trailer and my nurse a Cam Cream smothered sergeant It did not take me too long to remember such concepts as grid references and map reading and indeed I learnt new skills too driving in complete darkness and maintaining a sense of humour and driving in complete darkness hitting a tree or ten and still maintaining a sense of humour (*Fig 1*)

The two high points of the exercise were a Battalion live firing practice which was of

Fig. 1. The author proving that a Surgeon Lieutenant Commander is competent to its standards. The Norfolk Hill Near [illegible]

Fig. 2. The 3 RGJ medical team at Norfolk Oct Nov 1990 (from left to right Lieutenant R.P. Cranes Sergeant L.E. Beck Surgeon Lieutenant (D) M.W. Aston L/Corporal M.R. [illegible] the author

course dangerous but very well controlled and the storming of the FIBUA mock-up village which was again most exciting. During the second week of the STANTA exercise we were joined by Surgeon Lieutenant (D) M.W. Aston the Royal Naval Dental Officer who looked after the teeth of 3 RGJ (*Fig. 2*) and during both the live firing and the FIBUA village storming we were kept up with the action by being escorted by the new Commanding Officer 3 RGJ Lt Col Jamie Balfour. Despite the fun the exercise was obviously a hard test for the Battalion and was designed to keep them as an efficient means of defence for the taxpayers. It should be noted that we treated about 150 patients during the exercise and found the RAF Hospital at Ely most helpful in accepting patients both for casualty and in-patient care as necessary. It can only be hoped that this hospital will continue to provide such a valuable service to the military training area quite apart from the many RAF stations in the region. Again many memories will remain with me: climbing out of my sleeping bag and into a shell scrape at 05 30 eating from mess tins in pitch darkness and not being able to see what I was eating; not bathing for a longer period than would be considered reasonable by the World Health Organisation and indeed the ever present 3 RGJ humour.

Readers of the Journal will be pleased to know that Mark Aston and I hoisted the White Ensign onto the FIBUA village church roof as a finale to the exercise (*Fig. 3*).

Fig. 3. [illegible] FIBUA [illegible]

In this increasingly tri-service world [illegible] we serve it can only be beneficial [illegible] for exchange type jobs such as this for personnel at my relatively junior level. Greater understanding between the services is essential as we enter the 1990s. In this increasingly economy-conscious era where one of our adversaries is quite rightly the Treasury maybe the Trade Union motto 'United we stand divided we fall' should be noted by all personnel in the Armed Forces.

The kind of understanding that I gained from my year with 3 RGJ was almost unique for a Royal Naval Medical Officer and I wish to express my sincere thanks to the officers and men of 3 RGJ for the welcome and camaraderie they extended to me and my family during my year with them.

The Editor will welcome articles and professional commentary based upon the experiences of RNMS personnel during all phases of the preparation for and execution of the medical support tasks necessitated by the Gulf War

Notice

Copies of the facsimile Journal of the Royal Naval Medical Service Volume 1 Number 1 which was produced for the Journal's 75th Anniversary are still available free on request from the Editorial Secretary

J roy nav med Serv 1991 77 123–124

New fighting team heads Royal Naval Reserve Medical Branch

Surgeon Captain James Walsh has relieved Surgeon Captain Roger Berry as Captain Medical Training (Reserves) Following the re-organisation of the RNR command structure in 1988 there are now two reserve Commodores and six RNR Captains Captain Medical Training (Reserves) can be medical or dental and has overall responsibility for war role training of medical and dental officers QARNNS(R) nursing officers and RNR Medical Branch and QARNNS(R) ratings He reports to Commodore (Specialists Personnel and Support)

James Walsh was born in Kenya and educated at Wimbledon College and the London Hospital Medical College where he was an RN Cadet On qualifying in 1967 he was appointed to RNH Bighi He remained in Malta until 1972 becoming O and G Specialist at RNH Mtarfa but was then appointed to HMS *Lowestoft* in which he served as medical and diving officer in the Gulf South and East Africa (Beira Patrol) visiting Singapore Hong Kong the Maldives the Seychelles (as Royal visit guardship) the Mediterranean and participating in the cod war with Iceland—as well as qualifying as bridge watchkeeper He terminated his short service commission in 1973 and joined Sussex Division RNR where he became Principal Medical Officer in 1976 and was promoted Surgeon Commander He was awarded the General Service Medal (Northern Ireland) in 1980 for service on multiple Grenada patrols More recently he has been one man in Hong Kong with multiple recalls to RN service in HMS *Tamar* In civilian life he has been a general practitioner in Kustington and Littlehampton since 1973 having been unsuccessful Liberal candidate for parliamentary seats in Hove and Arundel and for the European parliamentary seat for West Sussex on several occasions he was a very successful Mayor of Littlehampton in 1989 90 A police surgeon in Littlehampton since 1982 he is also Area Surgeon for West Sussex in the St John Ambulance Brigade and was admitted as a Serving Brother of the Order of St John in 1989 He was the first Principal Medical Officer (Reserves) to serve in the rank of Surgeon Commander appointed in 1988 and was promoted Surgeon Captain RNR in October 1989 He relieved Surgeon Captain Berry as Captain Medical Training (Reserves) on 6 April 1990

Surgeon Commander Alan Waterworth who relieved James Walsh as PMO (Reserves), is a consultant general surgeon at Walsgrave Hospital Coventry and St Cross Hospital Rugby Trained at St George's Hospital Medical School he joined the RNR in 1967 He served with the Royal Marines Reserve and the Special boat Squadron (Reserves) and won his parachute wings in 1969 He was appointed SMO to the RNR Communications Training Centre Birmingham in 1978 This unit became HMS *Forward* in 1982 and he was promoted Surgeon Commander Recalls to RN service as consultant surgeon included two recalls to Musgrave Hospital Belfast for which he was awarded the General Service Medal (Northern Ireland) as well as multiple recalls to the Field Surgical Team Belize Princess Marina's RAF Hospital Cyprus and to RNH Haslar Following two successful training periods with 308 Evacuation Hospital, RMAC(V) at Saighton Camp Chester he was commanding Officer of the RNR medical team embarked in the RFA *Sir Tristram* for the amphibious exercise MEDEX 89 and commanding officer for the first ever all RNR casualty evacuation (ship simula

tion) exercise held at Saighton Camp in May 1990

Surgeon Captain Roger Berry has been retained on List 5a (for senior officers who are fully trained and can be recalled as required) The only RNR officer ever to serve in nuclear submarines—and to qualify as a watchkeeping officer—he continues to be employed by CINC NAVHOME as DISTAFF for the annual nuclear weapons or submarine reactor accident exercises

J roy nav med Serv 1991 77 125–126

Letters to the Editor

Sir

The article by Robert Maddysley W(h)ither the Naval Hospitals? reprinted from the Naval Review highlights the importance of the wartime clinical support to the fighting efficiency of the Royal Navy and Royal Marines. The article also suggests that without naval hospitals recruitment would suffer the war role would be insupportable and that the branch would become an occupational health branch who would train outside the hospitals. Those of us who have chosen to be specialists in occupational medicine (diving aviation submarine and radiation and industrial) and applied physiology are also particularly interested in ensuring that the clinical specialists and hospitals prosper. Where else would the naval advances in treating decompression sickness air embolism peptic ulcers and nephrolithiasis have been undertaken?

Many of us who have undertaken novel human non therapeutic research in hypothermia, submarine escape and rescue biochemical effects of raised CO_2 and cardiac effects of halon fire-fighting agents at INM and at ARE could not have conducted such trials without the invaluable support of the clinicians the nuclear medicine department and the laboratories at Haslar. All of this research has contributed to the efficiency and safety of the naval fighting machine.

The Royal Naval hospitals are an essential naval asset in peacetime and war.

JOHN HARRISON
Surgeon Captain Royal Navy
Head of Defence Radiological Protection Service

REFERENCE

1 Anon W(h)ither the Naval Hospitals? *J roy nav med Serv* 1990 76 155–158

Dear Sir

I was very interested to read the article by Sheard on haematological and biochemical screening. I am now employed by an organisation which carries out screening of well persons to find early indicators of disease as well as screening those exposed to potentially toxic chemicals. He is correct to question the normal reference values of hyperhaemia but I am [illegible] appropriate [illegible] ment laboratory [illegible] results for that group [illegible] reference ranges of those [illegible] may be biased by the [illegible] from all persons. Of course [illegible] a historical one for the [illegible] of longitudinal screening [illegible] article. Haematological and [illegible] has also been found of use when normal [illegible] the employee are determined before [illegible] chemicals.

There are other opportunities to set up [illegible] reference values in the Royal Navy [illegible] prodnee effective screens. Lung function [illegible] routinely for submarine escape could be used to set reference values for Royal Naval personnel which would be more appropriate than those supplied by manufacturers of test equipment. Secondly the ergonomic survey of Royal Navy and Royal Marines personnel could be used to update the normal weights for height and age data included in DR 1750A. I believe the current data is still modified from American life insurance applicants in the 1950s. Posture and nutrition have changed greatly since then.

Yours sincerely
G M HELLIWELL
Medical Officer
Occupational Health Service
The Boots Company plc

REFERENCE

1 Sheard SC Haematological and biochemical screening of potential Royal Naval entrants *J R Nav Med Serv* 1991 77(1) 11–16

Sir

As secretary of the recently convened Anglo-Australian Northern Iraq Medical Society I have the honour of presenting a summary of the topics covered at the inaugural meeting held 31 May 1991 together with a list of attenders. It is proposed to hold a weekly meeting covering topics relevant to our present practice

Those attending
Royal Navy
Surgeon Commander C Kershaw
Consultant Paediatrician
Surgeon Commander A Miller
Consultant Physician
Surgeon Commander D Sommerville
Consultant Orthopaedic Surgeon
Surgeon Commander S Tighe
Consultant Anaesthetist
Surgeon Lieutenant Commander P Loxdale
Registrar in Surgery
Surgeon Commander P Kemp
Registrar in Medicine
Surgeon S Rudland Registrar in Anaesthesia
Royal Australian Army
Major J Hodge Director Australian Field Hospital
Major J Little General Practitioner
Captain R Gilbert Nursing Officer
Captain J Morris General Practitioner
Captain T Tran General Practitioner
Royal Army Medical Corps.
Major R Thomson General Practitioner

Major Mark Little gave a fascinating presentation on snake bites. The dressing station had already admitted a Kaid bitten by a viper which made the presentation very relevant. In addition Australia has more venomous snakes than any other country so he spoke from a position of experience. The key to the management of venomous snake bites is first aid. The Australians do not advocate the use of tourniquets or incision at the bite site. These actions increase tissue damage, risk bolus venom delivery to the systemic circulation when the limb is released and may result in profuse bleeding if the venom contains an anticoagulant. Nor do they recommend sucking of the bite site: this is ineffective and may predispose second victims.

Most bites are restricted to the upper or lower limb. The whole limb should be firmly bound with a crepe bandage using a tension appropriate for a common sprain. The affected limb is then immobilized. To this end all Australian servicemen carry a crepe bandage when in the field. The effect of the compression bandage is to arrest the macromolecule venom in the lymphatics and so prevent its progress into the systemic circulation. Animal work has apparently illustrated this technique to be effective for 72 hours although there is no comparative human study.

The victim should be transported to a specialist centre where the dressing can be taken down. Development of lymphadenopathy and then systemic headache and vomiting within four hours suggests envenomation has occurred. In Major Little's experience half of all cases have no clinical evidence of envenomation. Systemic symptoms are an indication for the use of polyvalent venom prepared from horse serum. Due to the wide range of venomous snakes in Australia test kits have been developed which sample residual venom at the inter site and indicate the causative species. Anti venom is not without risk itself and despite routine pre-treatment with adrenaline full blown anaphylactic reactions do occur. Systemic collapse such as hypotension due to neurotoxin and disseminated intravascular coagulation once established are resistant to the anti venom and require full ITU support.

In conclusion we feel fortunate that not only snake bite to date was probably not envenomated.

I have the honour to be
Sir
Your obedient servant
S RUDLAND
Surgeon Lieutenant Royal Navy

J roy nav med Serv 1991 77 127–128

Book Reviews

Resuscitation Handbook P J F Baskett Pp 111 New York Gower Medical Publishing 1989 £10 95

This latest publication on the subject of resuscitation is the best available The author is internationally renowned for his expertise and has managed to combine his own approach not only with that of the resuscitation council but also with the principal of Advanced Trauma Life Support The book can be purchased together with a collection of 145 slides which reproduce the outstanding art work and graphics At £165 this represents exceptional value

The book is divided into five sections introduction cardiac life support trauma life support pain relief and training requirements Each section is designed in a supremely logical fashion in order of clinical priority from the most basic to the most advanced techniques available Despite the wide scope the book is only 111 pages long and can be easily read and understood in a couple of hours This remarkable achievement has been realised in an deliberately didactic approach As a result it is easy to be critical of the detailed content and miss the overall aim of a clear concise and practical message

There are however some potentially hazardous inaccuracies The calculation for paediatric tube diameter is not mg/2 + 4 millimetres but mg/4 + 4 5 millimetres Cricoid pressure is obviously applied to the cricoid and not to the thyroid cartilage and a second cannula should be inserted into the cricothyroid membrane during jet ventilation The chest drainage illustration shows the tube in the anterior axillary line perhaps pericardially rather than in the mid axillary line as described in the text

The superb algorithms are an extremely useful aid to management but it would have been useful to include airway techniques as well More details on the jaw thrust cervical spine stabilisation and cricothyroid incision would be welcome in view of their relative importance

The reviewer is going to incorporate this approach into resuscitation lectures given to the LMAP QC and C4 courses The book and accompanying slides could therefore be issued to all establishment sickbays as the basis of on going training for RN medical personnel It is strongly recommended

S Q T

ABC of AIDS Second [illegible] Pp 72. British Medical [illegible] UK £10 95 Abroad £13 50

This book is another in the excellent BMJ series of ABC books Knowledge about AIDS and HIV infection is developing so rapidly that it would realistically require a new edition every year to keep even roughly up to date and it is four years since the first edition of this volume Unlike Adler's recent book on ABC of Sexually Transmitted Diseases which was essentially written by a single author this present publication has multi author offering which does result in the predictable problems of duplication and inconsistency It has a short book and gives no references to suggestions for further reading, but is generally accurate in the areas up-to-date and would give a good introduction to AIDS and HIV infection to someone looking for a concise readable text However I completed a number chapters covering for more information

Surprisingly the chapter on the virus itself does not give any diagram of viral structure or mention the genetic make up and yet through out the rest of the text such phrases as GP 120 and P24 antigen are used regularly with little explanation of what they mean However the selected descriptions of the testing process In Adler's chapter on the natural history of infection he does not clarify the distinction between chronic and latent infection This is a confusion which often exists in spoken lectures and it is shame that the opportunity is not taken to resolve the issue Other than introducing the CDC classification for HIV disease this chapter is largely redundant and could readily be absorbed into succeeding chapters

Model's chapter on early HIV infection gives a useful algorithm on indications for lymph node biopsy in persistent generalised lymphadenopathy (PGL) it also has some nice photographs However in discussing prognostic markers there is inadequate emphasis on monitoring of the CD4 count In discussing follow up of patients with HIV infection no mention of CD4 monitoring is made Clearly nowadays this would form a vital part of follow up as it is on the basis of the CD4 count that the decision to introduce therapy is made

There is an excellent chapter on AIDS in the lung

with good didactic guidelines for treatment which is subsequently duplicated in the general chapter on treatment of HIV related conditions. It is surprising that several chapters are still recommending ketoconazole for the treatment of oesophageal candidiasis despite the known serious hepatic toxicity of ketoconazole. Overall the treatment chapter I felt that there was inadequate discussion of the proven and established antiretroviral therapies as this is one of the most important issues at present. The chapters on Counselling, Nursing Care and Psychological Support are all excellent and show good commonsense as does the section on Control of Infection and it should be required reading by any nursing staff who are looking after HIV infected patients.

Overall this is a well produced excellent introductory book which should be readily available on any medical department where HIV positive patients are being seen.

AROM

Controversies in Therapeutics Ed Peter Rubin Pp 167 British Medical Journal January 1991 UK £9.95 Abroad £12.00

This is an interesting book. Comprising 17 articles from the BMJ it is principally aimed primarily at GPs. The editor is Professor Peter Rubin who holds the chair of Therapeutics at Nottingham. In each article he poses a controversial question which occurs in everyday practice and where the answer is controversial. The contributors then each argue each side of the controversy supporting their arguments with references. The polarity of the debate varies from complete disagreement to several articles where the contributors seem to agree on the main points.

The topics cover the length and breadth of medicine and so the specialist reading gets the his own field as well as the GP will find much of interest. On the whole Prof Rubin has achieved his aim of choosing questions which arise in every day practice. There are some such as Where to start in the investigation of childhood epilepsy which are in the province of the specialist. They are interesting nonetheless.

Without a deep knowledge of the subjects it is difficult to come to a conclusion on the relative merits of each argument. To assist with this the editor has written a short comment for each article which I take to be the consensus.

A problem with a book on therapeutics is that it quickly becomes dated. This is particularly true when controversial topics are discussed. An example is in The article on the use of NSAIDs in peptic ulcer disease which was written before the introduction of misoprostol.

The book is well presented in A5 format and its style makes it easy reading. Although I would not buy this book I would certainly borrow it from the library to whose shelves it would make a useful addition.

RAC

J roy nav med Serv 1991 77 129

Obituaries

Petty Officer Medical Assistant Eric Gordon Burrows died 17 December 1990 on the Isle of Wight at the age of 67.

Eric (Wally) Burrows served in the Royal Naval Medical Branch from 1950 to 1970 having previously served for two years in the Army. He retired to the Isle of Wight initially as an Income Tax Inspector but ultimately to concentrate on his painting for which he was most well known and best remembered. A self taught artist Wally developed his own technique which made his work so recognisable in passion for detail and fine lines. His work was exhibited by the Royal Academy after which he distinguished his signature with the familiar seagull. Wally was perhaps best known for his marine-scapes but accepted commission for a wide variety of subjects his most notable being the painting of Sir Alec Rose's Lively Lady for the City of Portsmouth and a commission for Lord Mountbatten. Wally's work is now spread world wide and is a tribute to his talent and a lasting memorial to a man who was held in high regard by all who knew him.

We have sadly learnt of the death of **Surgeon Captain Philip Willis Edmundson Royal Navy** on 22 January 1991 in his 89th year also of **Surgeon Commander Charles Foster Cooper VRD RNR** on 27 September 1990 in his 74th year and of **Surgeon Lieutenant Commander Robert Wallace Simpson RN** on 26 March 1991 aged 71. Any personal reminiscences will be welcomed by the Editor.

We also regret to announce the death at home in Spain in April 1991 of **Mrs Veronica (Ronnie) Oliver ARRC** (nee Davison) formerly Sister including Sister QARNNS wife of Surgeon Captain R F Oliver Royal Navy.

Stop Press

As this Journal went to press we learnt of the tragic death of **Surgeon Captain R F Cumiter** on 7 June 1991 while on a fishing trip and also of **Surgeon Commander A J Hirst** Royal Navy on 7 July 1991. Obituaries will be published in the Winter Issue.

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SERVICE NEWS

ROYAL NAVAL MEDICAL AND DENTAL OFFICERS

APPOINTMENTS AND PROMOTIONS

To Surgeon Rear Admiral
and appointed Surgeon Rear Admiral
(Operational Medical Services)
5 March 1991

A L Revell QHS

To Surgeon Commodore and appointed
Director of Clinical Services
19 February 1991

J M Beeley QHP

As Queen's Honorary Surgeon
5 March 1991

Surgeon Captain M J Munn

As Assistant Director
Naval Dental Services
2 April 1991

Surgeon Captain (D) E J Grant

As Command Medical Officer
in CINCNAVHOME
10 August 1991

Surgeon Captain D M Crean

As Command Dental Surgeon
in CINCNAVHOME
22 April 1991

Surgeon Captain (DI R S Hambly

As Consultant Adviser in Aviation Medicine
to MDG(N)
5 March 1991

Surgeon Captain A P Steele-Perkins

As Adviser in General Practice
to MDG(N)
9 September 1991

A/Surgeon Captain R D Curr

As Adviser in G U Medicine
to MDG(N)
8 May 1991

Surgeon Commander C N Warlow

To Surgeon Lieutenant

P D Edwards J G Shorpley

To Surgeon Lieutenant (D)

J P McVeigh S Wolstenecroft

HIGHER QUALIFICATIONS

Surgeon Commander K E Ashton—MD
Surgeon Lieutenant Commander
N C G Richards—AFOM
Surgeon Lieutenant Commander
P J Benton—AFOM

It has been brought to the Editor's attention that Surgeon Lieutenant Commander M S Smith has been elected a Fellow of the Royal Geographical Society

CONSULTANTS, SENIOR SPECIALISTS AND SPECIALISTS

The following professional advancements are announced

Consultants

Anaesthetics

Surgeon Commander C G Johnston—Oct 1990

General Medicine

Surgeon Commander M L Cowley—Oct 1990

Surgeon Lieutenant Commander M M Parrish has completed GPVT

NEW ENTRIES

Surgeon Lieutenant (DI K C Lamb

PLACED ON EMERGENCY LIST

Surgeon Lieutenant Commander D F Cumbertidge
Surgeon Lieutenant Commander G A M [illegible]

RETIREMENTS

Surgeon Captain B C Telfer
Surgeon Captain (D) S N Bassett
Surgeon Commander A C Chakravarty
Surgeon Lieutenant Commander G J Brooks
Surgeon Lieutenant (D) K A Poole

MEDICAL SERVICES

QUEEN'S BIRTHDAY HONOURS 1991

British Empire Medal
Medical Technician T L Wilks

PROMOTIONS

To Acting Sub Lieutenant
T J Gurrell C J McLaughlin

Provisional Selections for Promotion to date 1 October 1991

To Commander
G Marshall

To Lieutenant Commander
P J Newcome A Harrington
M Hazell K Baker R A Edwards
A Hughes

Provisional Selections for Promotion to date 31 March 1992

To Warrant Officer (SEA)
R B Taylor

To Warrant Officer (RCN)
A E Byrne

HIGHER QUALIFICATIONS

MT1 (RTR) Jackson—BSc (Hons) (Applied Radiology)

RETIREMENTS

Commander H R Hussey OBE
Lieutenant Commander E Keeble
Lieutenant Commander R Earlland

The new Head of Medical Service Branch is Commander D F Shine, presently Officer in Charge of the Royal Naval Medical Staff School

Petty Officer Medical Assistant D Preston (left) and Sub Lieutenant (MS) P Chilcott from the Naval Institute of Naval Medicine in Gosport successfully completed the 1991 London Marathon which took place on 21 April 1991 in a time of 3 hours and 14 minutes and 3 hours and 41 minutes respectively

MT1 P D Jackson had passed BSc (Hons) in Applied Radiography studying at Guys Hospital. MT1 Jackson joined the Royal Navy 19 years ago and has served as a radiographer in both Royal Naval hospitals HMS *Dryad* and HMS *Nelson* and in the staff of JSSR Woolwich. He is currently serving in RNH Haslar

QUEEN ALEXANDRA'S ROYAL NAVAL NURSING SERVICE

QUEEN'S BIRTHDAY HONOURS 1991
Member of the Order of the British Empire
Superintending Nursing Officer I E Young ARRC

Royal Red Cross
Chief Nursing Officer V C Fisher ARRC

Associate of the Royal Red Cross
Superintending Nursing Officer R Savage

PROMOTIONS

To Superintending Nursing Officer
J M Omions

To Senior Nursing Officer
C Hicks E A Linden A F Paker

NEW ENTRIES

Nursing Officer S J Varney

WITHDRAWN ON COMPLETION OF SHORT CAREER COMMISSION

Senior Nursing Officer J V Paker

RETIREMENTS AND RELEASES

Superintending Nursing Officer
E M Chandler
Nursing Officer J E Crisp

ROYAL NAVAL RESERVE

PROMOTIONS

To Surgeon Lieutenant Commander
D G Martin (*Dreadnought*)
A Narlot (*Sussex*)

NEW ENTRIES

Probationary Surgeon Lieutenant
D J R Duthie (*Grafham*)
Probationary Surgeon Lieutenant (D)
S M Baldwin (*Eaglet*)

RESIGNATIONS

Surgeon Lieutenant Commander B Dennison (*Gallhope*)
Probationary Surgeon Lieutenant F A Hawkins (*Hessex*)
Probationary Surgeon Lieutenant P J Swinhoe (*Eaglet*)

PLACED ON RETIRED LIST

Surgeon Captain J Shaw RD*
Surgeon Commander R P K Burchell (*Cantrant*)
Surgeon Commander N A Mulcahy Sm[illegible] RD (*Clairvaux*)
Surgeon Lieutenant Commander D R Morgan (*Hessex*)
Surgeon Lieutenant Commander J B Day (*Pembroke*)
Surgeon Lieutenant Commander P R Densham RD (*Dundee*)
Surgeon Lieutenant Commander R Torquet (*Pembroke*)
Surgeon Lieutenant Commander I J T Davies (*Clairvaux*)
Surgeon Lieutenant Commander (D) J Connah (*Palatine*)

News of retired officers

Surgeon Captain D S Wright who retired from the Royal Navy in 1985 has been elected Dean of the Faculty of Occupational Medicine of the Royal College of Physicians

Commander M G Harper OBE, Head of Medical Services branch from 1981 to 1984 has been elected Mayor of Fareham Hampshire

Commander Harper joined the Royal Navy as a Sick Berth Attendant. He originally trained as a Medical Laboratory Technician but subsequently transferred to the Health Physics specialisation and served for 21 years in the nuclear submarine programme which included standing by and commissioning HMS *Dreadnought* the first nuclear powered British submarine. He was promoted to Sick Berth Chief Petty Officer in 1964 and to Commander (Medical Services) in

1979. He retired from the Royal Navy in 1984 following a final appointment as Head of Medical Branch Personnel with MDG(N). During his service career Commander Harper obtained a Master of Science degree in Radiation Physics from the University of Surrey and a Master of Arts degree in Public and Social Administration from Brunel University. He was awarded the Order of the British Empire and was also made a Serving Officer of the Order of St John of Jerusalem on retirement from the service.

On leaving the Navy Commander Harper joined the staff of the North West Thames Regional Health Authority where he served as the Regional Estates Manager. In 1989 he moved to Coffin Mew and Clover a firm of local solicitors where he still works as the Director of Administration. He became a Fareham Borough Councillor in 1987 and was the Chairman of the Housing Committee. He was elected as the Deputy Mayor of Fareham in 1990 and became the Mayor of Fareham on 9th May 1991.

Royal award ceremony for service doctors

HRH the Duchess of Kent presented certificates to two winners of 1990 Smith and Nephew Foundation grants to service doctors at an award ceremony at the Banqueting House in Whitehall on 1 May 1991.

In 1986 the Foundation offered the first bursary to doctors serving in any of the three armed services to enable winners to undertake a short period of research abroad.

Last year Squadron Leader O'Reilly RAF was the successful candidate. A consultant ENT surgeon at Princess Mary's Hospital RAF Halton and honorary

consultant at the Royal London Hospital he went to Switzerland where he studied head and neck reconstruction surgery and osseointegration under Professor Claus Walter in Heidelberg.

In 1990 the Foundation offered bursaries to enable service medical personnel to attend courses and seminars in the UK. One of the first recipients of this new award was Surgeon Commander Pingree a consultant in occupational medicine at the Institute of Naval Medicine in Gosport. He attended a course in Interpretation and Measurement Techniques in Noise Control at Southampton University.

The photograph shows from left to right Kenneth Kemp President Smith and Nephew Foundation Squadron Leader O'Reilly and Surgeon Commander Pingree.

The Smith and Nephew Foundation was established in 1974 and supports Fellowships Scholarships and Bursaries for education and research in the medical nursing and allied professions.

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JOURNAL of the ROYAL NAVAL MEDICAL SERVICE

Contents

Notice to Authors

Contributions should be submitted to the Editorial Journal at the **Royal Naval Medical Service, Institute of Naval Medicine, Alverstoke, Hants PO12 2DL**, who will arrange for any necessary security clearance. The submission of Medical Branch personnel is drawn to the provisions of QRRN Annex 68A para 6a

Manuscripts should be prepared in the Vancouver style [1]. They should be typewritten with double spacing and wide margins and should include title page, abstract (of not more than 150 words), introduction, method, results, discussion and references, each section commencing on a separate page. A convenient length is between 2000 and 3500 words plus essential tables or illustrations.

Tables and illustrations should be referred to in the text. Tables should be typed in double spacing on separate sheets. Figures should be professionally drawn, making due allowance for the appropriate reduction. Glossy black and white photographs should be submitted unmounted, whenever possible. Titles and detailed explanations should be given in the legends which should be typed on a separate sheet.

References should be numbered consecutively in the order in which they are first mentioned in the text. At the end of the article the full list of references should give the names and initials of all authors (unless more than six, when only the first three should be given followed by *et al*.). The authors' names are followed by the full title of the article, the full title of the journal abbreviated according to the style of *Index Medicus*, year of publication, volume number, and first and last page numbers. Titles of books should be followed by the place of publication, the publisher, and the year, e.g.

> Soter NA, Wasserman SI, Austen KF. Cold urticaria: release into the circulation of histamine and eosinophil chemotaxin factor of anaphylaxis during cold challenge. *N Engl J Med* 1976; **294**:687–90
> Osler AG. *Complement: mechanisms and functions*. Englewood Cliffs, Prentice-Hall, 1976

1 The Vancouver style. *J roy nav med Serv* 1979; **65**:178
2 International Committee of Medical Journal Editors. Uniform requirements for manuscripts submitted to biomedical journals. *Br Med J* 1982; **284**:1766–70

Notice to subscribers

The Journal of the Royal Naval Medical Service is published three times a year in April, August and December, one volume comprising three issues. Subscribers are reminded that the annual subscription has been increased from 1 January 1992. The new rates are as follows.

1 RN and RNR medical and dental personnel on the active or retired list, Consultants to the Royal Navy Medical Service, all QARNNS personnel, other Service or civilian personnel—**£12.00 a year post free**
2 Personnel as above aged 65 years and over who have subscribed continuously for 25 years or more—**£9.00 a year post free**, however there will be no increase for those subscribers who already pay the reduced subscription of £5.00 a year
3 All other categories—**£15.00 a year post free**

All communications relating to subscriptions and notification of changes of address should be forwarded to **the Editorial Secretary, Mercklein House, Institute of Naval Medicine, Alverstoke, Hants PO12 2DL**

NOTICE TO ADVERTISERS

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Advertising Rates and Technical Data is set as listed in British Rate and Data

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Editorial

For Better or for Worse

Since 1950 the manner in which medicine is practised within the Royal Navy has changed dramatically Many who were part of the service in the fifties and sixties would if they returned, hardly recognise it as the same service they knew Medical Officers in all specialities from occupational medicine through general practice to hospital disciplines strive daily to achieve post graduate qualifications and to achieve professional recognition by their respective Colleges Career progression is paramount No longer is half day working the norm and no longer is the service a refuge for those who might have found it difficult to measure up to the professional atmosphere in the then recently created National Health Service

Indeed the sixties and seventies was the period when due to the vision and foresight of mentors such as Surgeon Vice Admiral Sir James Watt the Royal Naval Medical Service achieved credibility in the eyes of our civilian peers Consultants were recognised as accredited by the Colleges and were recognised as being of equal standing with those in civilian practice The standard of primary and secondary care and preventative and occupational medicine practised within the Royal Navy was as good as if not better in some areas than that in the NHS Resources were plentiful and the Royal Navy reaped the benefit

Since then we have seen a contraction of the service we provide Memories of the Naval Hospitals at Bighi and Chatham Terror and Trincomalee are almost beyond that of even our most senior Medical Officers That contraction continues Even as this is published the Royal Naval Hospital at Plymouth is under threat of closure and manpower and material savings are being sought across the board The Royal Naval Medical Service is taking its fair share—some would say more than its fair share—of the cuts implicit in the Government Policy statement Options for Change

Cutting the cost of peacetime medical support to the Royal Navy has been foremost in the minds of Government Ministers for the last decade We are an expensive luxury in peace, but are the first asset demanded in war to support the teeth of the service In the last ten years we have fought two minor wars, one in the South Atlantic and the other in the Gulf and yet the cuts and closures continue unabated Our cause is hampered by the incredibly low casualty figures sustained in both conflicts one it is postulated to the poor training and dubious commitment of the opposition This must in due course cause the operational planners to downgrade all casualty estimates for war We must hope that we never have to fight against any foe better equipped and trained than the third world despots in Argentina and Iraq

In order to assist the Government in its avowed policy of a leaner fitter and more efficient service the New Management Strategy is now reality At last the responsibility for the management of financial resource is being devolved to the lowest possible level Commanders and managers in all areas of defence are able to operate more efficiently by the removal of unnecessary constraints on their managerial freedom of action, whilst ensuring that they remain fully accountable for their actions and the use they make of public money Objectives cascade from the Departmental Plan to budget holders and the resulting management plans determine the resource requirement Actually nothing has changed The management plan must fit the budget, or be altered to do so No matter what our dreams and aspirations for the

future it appears that if it costs money it is unattainable

This management strategy which includes the line authority for funding, has led to the recognition that the positions of the two peripheral Surgeon Rear Admirals are barely tenable Moves are now afoot to align SRA(OMS) with CINCFLEET and incorporate SRA(SMS) into the CINCNAVHOME organisation At last we have achieved recognition by the executive that we can only effectively conduct our business if we live and work alongside the commands we support This has led to the position unthinkable even five years ago that both SRAs could be divorced from the line authority of MDG(N) Some will argue that this puts the future of the medical flags in jeopardy and this may well be so but should any attempt be made to downgrade the top medical management structure the signal will go out to the Royal Navy at large and to medical officers in particular of the worth with which their day to day professionalism and that displayed in the conflicts of 1982 and 1991 is regarded

The career attenuation resulting from any attempt to cap medical officers at Surgeon Captain level can however be alleviated with some proactive moves on our part. If we examine in some detail the role of medically qualified Naval Officers in the Royal Navy of the nineties In 1956 engineers electricians, supply officers and instructors were all incorporated into one company with seaman officers as Royal Navy Officers of the General List and at the same time lost the beloved distinction lace which had identified their separate specialities Since that time it has been possible for an engineer to become Controller of the Navy or Captain Fleet Support for an electrician to become Flag Officer Portsmouth and for a supply officer to become Second Sea Lord Why not a doctor? Medical Officers join the Royal Navy with impeccable academic qualifications far superior on the whole to those of their executive contemporaries Their Naval careers differ only in that Doctors do not spend their first year at Dartmouth and generally staff training is denied them We have however the capability to be equal or even better in the staff environment than those who presently dictate the future of the Medical Service

There was a time when we could safely sit back and tell the Royal Navy that they needed us more than we needed them That is no longer true and we must wake up to the reality that changes are presently taking place and ensure that we are in a position to plot our own future We have to protect professional medical standards We must promote a new breed of Medical Officer able and willing to take on staff work not just within the medical sphere but in the Royal Navy at large using the experience of medical training as a basis and we must produce a new and exciting environment for career Medical Officers that offers not only opportunities in medicine but offers a parallel and possibly second career in challenging staff work outside medicine but in the Royal Navy

Unless we adapt to this changing environment we risk allowing the achievements of the last twenty years to be impeached by those who think they know more about medical support than the doctors The calibre of Medical Officers we recruit and retain will tend to decline and we will slide back into the professional dustbin from which we have struggled so hard to emerge We could find that in ten years time those who remember the second rate service we provided in the fifties could with honesty reflect that not much has changed really

The Editor is indebted to Surgeon Captain John Soul Royal Navy, for his observations and invites communiqué from the readership

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Circum-Rescue Collapse: Collapse, sometimes fatal, associated with rescue of immersion victims

F St C Golden, G R Hervey and M J Tipton

INTRODUCTION

It has long been known though it is still not always appreciated, that victims of accidental immersion may collapse and may die during the process of rescue or shortly afterwards We propose to call this syndrome circum rescue collapse[1] It was at one time thought that it was directly related to after-drop the continued fall in core temperature that occurs after a subject is removed from cold water which would imply that circum rescue collapse is caused by hypothermia

In 1981 however Golden & Hervey[2] showed that the after-drop can be fully explained by temperature gradients between deeper and superficial layers of the body and the physical laws of heat flow its association with circum rescue collapse is therefore coincidental They presented arguments that led them to suggest that the key event may be collapse of arterial blood pressure

Since then attempts have been made to test this hypothesis more rigorously using the cold tank facility at the Institute of Naval Medicine[3] Regrettably higher priority tasks, the Falklands Campaign ethical considerations and career moves have all impeded completion of the project Meantime the hypothesis has become somewhat widely disseminated and it has prompted changes in rescue procedures Since there are inescapable difficulties in completing the study to ideal scientific standards but the applications are important now it seems timely to review the information available and to examine the conclusions for practical rescue procedures

HISTORICAL REVIEW AND ANECDOTAL EVIDENCE

Sudden loss of consciousness or death during or following the rescue of immersion victims came into prominence during the Second World War because of the frequency with which it was encountered but there are many earlier records of circum rescue collapse and death

In the 18th century James Lind[3] was the first to emphasise the danger of collapse in the post immersion period James Carrie[4] observed the deterioration of his experimental subjects condition post immersion In the 19th century Sir John Richardson appears to have been well aware of the dangers that faced him after rescue[5] and Varigny[6] also recorded death after rescue

During the enquiry into the sinking of the *Titanic* in 1912 one witness Fifth Officer H G Lowe described how the crew of his lifeboat rescued four men from the water and one subsequently died Another witness in a different lifeboat Mrs E B Reynolds described how

Surgeon Rear Admiral Golden is based at the Royal Naval Hospital Haslar Professor Hervey is Emeritus Professor of Physiology at the University of Leeds and Civilian Consultant in physiology to the RN Medical Service Dr Tipton is from the Robens Institute University of Surrey and is based at the Institute of Naval Medicine Correspondence Dr M J Tipton Institute of Naval Medicine Gosport Hants PO12 2DL, England

two immersion survivors died in the boat shortly after rescue.

In the First World War the sinking of the *Lusitania* provides several accounts of survivors rescued alive subsequently dying on the rescuing fishing boats.[7] After the first battle of the Falkland Islands it was reported that most of 200 survivors from the German battle cruiser *Gneisenau* died on board one of the rescue ships.[8]

These lessons of the First World War evidently went unheeded and it was not until the Second World War that the problem of collapse and death after rescue from cold water was again highlighted on both sides in the conflict. For the Allies MacDonald Critchley[9] emphasised the danger for shipwreck survivors and Wynburn[10] recorded some instances of death after rescue among ditched USAF personnel. In Germany Grosse-Brockoff[11] reported how men rescued alive from Norwegian fjords subsequently died from sequelae of hypothermia. Also on the German side the problem of Retting Kollaps (Rescue collapse) came to official notice during the Battle of Britain the highly efficient German Air Sea Rescue Services recovered a substantial proportion of ditched Luftwaffe and RAF personnel only to observe many die 20-90 minutes after rescue. The investigation of this problem was offered as justification for the notorious experiments at the Dachau concentration camp.[12]

It is of great interest that in the later stages of the war the German lifeboat service noted—albeit by serendipidity—that rescuing immersion victims by manoeuvring a ladder beneath them and lifting them horizontally improved their chances of survival compared with lifting in a vertical posture or requiring them to assist in their own rescue.[13]

The incidence of post rescue collapse is difficult to establish as death certificates generally record only the terminal event. Although pulmonary changes are usually found post mortem after drowning, their absence does not decide the diagnosis since it is estimated that 10-20% of drownings are dry drownings.[14,15]

Some deaths attributed to dry drowning may however have been caused by other mechanisms. Immersion victims whose history suggests that the airway was clear of the water at all times are sometimes inexplicably classed as victims of drowning. There are no post mortem findings that can positively identify cold as the primary cause of death. Reliable statistics are therefore an impossibility.

One of the few numerical indications of the incidence of post-rescue problems comes from McCance *et al*.[16] In their survey of merchant shipping losses during World War II they found that in a series of 289 shipwreck survivors of the 160 rescued from water at a temperature of 10°C or less 17% died within 24 hours of rescue (the questionnaire did not ask for finer timing). Of the 109 rescued from water above 10°C none died after rescue. Although the cause of the post rescue deaths was not known the association with low water temperature was thought to be significant.

MacNally[17] in his history of the medical services in war suggests that the problem may be even greater and not limited to very cold waters. He writes:

> A not uncommon feature observed in other waters as well as in the Arctic was that many survivors who had managed to get themselves to the point of being rescued from the sea collapsed when safety was within reach and required to be handled in the same manner as those who had been helpless while still in the water.

Keatinge's excellent account[18] of the sinking of the *Lakonia* off Madeira in water at approximately 18°C also shows that post immersion collapse is not confined to very cold water. He reports that of the 15 dead victims on the *Monticalm* the first rescue ship on the scene most were thought to have been rescued alive.

Post rescue death is also not limited to subjects who were already unconscious at the time of rescue. Matthes[9] describes how ditched aircrew who had been in the sea for relatively short periods and were fully conscious and able to assist in their own rescue lost consciousness after rescue and in some instances died. Orizen[20] describes a survivor from the passenger vessel *Lewis* sunk in 1928 collapsing and dying shortly after climbing into a lifeboat.

Other classic instances of post immersion collapse include the survivors of the *SS Empire Howard*.[21] The captain Capt Downey reported: 'Everyone was conscious when taken out of the water but many lost consciousness when taken into the warmth of the trawler. Nine (out of 12) died shortly after being rescued.' Similarly nine survivors from *HMS Kite* sunk on Arctic convoy in 1943 were rescued by a sister ship the *Keppel* all were conscious when rescued but only five survived.[22]

Documented examples of post-immersion

collapse and death in swimmers can be obtained from several sources [33] including the records of the British Long-Distance Swimming Association. Hardwick[34] gives an account of a swimmer collapsing and losing consciousness after forcible removal from the water after 11 hours of swimming in the Irish Sea. Lloyd[35] describes the sudden collapse and death of a speleologist who had been rescued in a hypothermic condition from a flooded cave, and had, shortly before, been enjoying a bar of chocolate.

Some rescue accounts give a more detailed picture of various forms of circum rescue collapse. Golden[36] described two cases of teenage boys dying from ventricular fibrillation (VF) in hospital after a boating accident. Although body temperatures were not recorded the circumstantial evidence and the condition of other survivors left little doubt that the victims had been hypothermic. In another accident investigated by one of the authors a 54-year old teacher was canoeing on Lake Coniston with two young female passengers. The canoe capsized and the three were immersed in water at 12°C for about ten minutes, during which time they held on to the upturned canoe. A rowing boat rescued the two girls but the teacher proved too heavy to be helped aboard and was towed ashore. On arrival ashore he complained of cold and numbness but was rational and coherent. His wet clothes were removed and he was massaged. A short while later he suddenly went rigid and died.

In June 1979 *HMS Jupiter* was involved in the rescue of survivors from the *MV Iris* which sank in the Bay of Biscay in a force 8 gale. The water temperature was 15.5°C, air temperature 12°C and the sea state 6 with a 25 foot swell. Rescue was effected in very difficult circumstances with the Ashanti rig (adapted from a helicopter lifting strop) and with the ship rolling through an angle of 45°. Of the 12 survivors rescued one died within minutes of rescue and one died halfway up the ship's side.

During the 1979 Fastnet race in water at 15–16°C three of the 15 fatalities among the competitors (20%) occurred during rescue, one in the course of lifting by helicopter and two while the subjects were trying to climb up a scrambling net.

Three further anecdotal accounts of helicopter rescues are worth putting on record.

i) The pilot of a light aircraft flying from Sweden to Denmark in winter ditched in the sea within sight of the lights of Copenhagen. The pilot scrambled on to the outside of the cockpit to await rescue. He remembers the rescue helicopter flying overhead and the winchman being lowered and putting the strop around him. His next recollection is of awakening in a hospital bed in Copenhagen.

ii) A young woman rescued from the sea off the coast of Cornwall in summer remembers the helicopter winchman putting the strop around her and the lift commencing. She regained consciousness some time later while lying in the helicopter cabin.

iii) A sailor who was washed overboard from an RN frigate off North Cape in 1965 (in sea temperature 5°C, air temperature −2°C and sea state 6) spent 8 minutes in the water before being rescued by helicopter. This was done with a single-man strop. He was successful on the third attempt in putting the strop around his body. His next recollection was of regaining consciousness as he was brought into a horizontal posture to be manoeuvred through the helicopter door. He subsequently made an uneventful recovery.

INSIGHTS GAINED

Consideration of the historical and anecdotal evidence suggests that three stages of rescue can be distinguished and each may be associated with particular risks. They are just prior to rescue (pre rescue), during the process of rescue (during rescue) and just after rescue (post rescue). These stages and their relationship to previously used terms are shown in *Fig 1*.

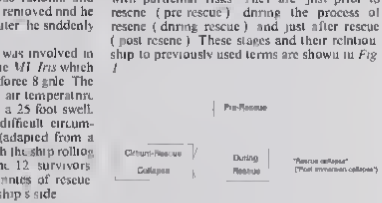

Fig 1 Stages of Circum rescue collapse and their relationship to previously used terms

Among the possible causes of death *drowning* as a consequence of inhaling fluid must clearly be considered. It may be the major

factor in victims whose airway was intermittently submerged and who gradually lose consciousness The delayed hypoxic effects of drowning have been well reviewed, for example by Modell [7] *Hypothermia* will be an important factor in those who have suffered prolonged immersion with an airway clear of the water

However the *sudden* deterioration in the victim's condition so often described with rapid loss of consciousness and sometimes sudden death suggests a more acute cause than either the progressive cerebral hypoxia of drowning or the loss of cerebral function as body temperature falls We shall suggest that *collapse of arterial pressure* is much more consistent with the events observed This suggestion which would apply at any body temperature is quite distinct from the well recognised concept that VF may be the terminal event in those suffering from profound body cooling

Re-warming collapse has been reviewed elsewhere [28] A suggested mechanism for this is a failure to maintain arterial pressure when extreme vasoconstriction is released during rewarming in subjects whose blood volume has been depleted by prolonged vasoconstriction and cold diuresis This may explain some post-immersion deaths particularly those that occur during re-warming procedures It clearly cannot account for cases in the pre rescue and during rescue categories The mechanism of sudden collapse and death at these earlier stages may also be important post rescue It merits detailed study

Pre rescue collapse

MacNalty's account[17] of survivors who at the point of being helped from the sea collapsed when safety was within reach implies sudden deterioration in the condition of some victims immediately prior to rescue Other accounts support this picture but it is inevitably difficult to establish the precise timing and thus the distinction from cases where rescue had begun Pre rescue collapse has not previously been distinguished and it is obviously difficult to evaluate hypotheses as to its mechanism It is however worthy of consideration We would again argue that the suddenness suggests a cardiovascular mechanism

In hypothermia prolongation of the isometric phase of myocardial relaxation and increased viscosity of the blood reduce coronary blood flow McConnell *et al*[29] showed that coronary vasodilation capacity (i e the maximum coronary flow achievable at any coronary perfusion pressure) is reduced in dogs in profound hypothermia (core temperature 28°C). This makes the heart more liable to ischaemia if perfusion pressure falls This is compounded by the leftward shift of the oxyhaemoglobin dissociation curve.

McConnell's group examined the effects of reducing coronary (i e. diastolic aortic) pressure from 100 to 50 mm Hg in 11 dogs at body core temperatures of 37 and 28°C At normal body temperature the reduction in coronary perfusion pressure was compensated by the vasodilation reserve capacity and endocardial perfusion remained adequate At 28°C the lowering of perfusion pressure led to a reduction by 44% in subendocardial blood flow and redistribution of blood away from subendocardial tissue This resulted in ischaemia and changes in the S–T segment of the ECG If perfusion pressure was immediately restored or if the heart was re-warmed subendocardial perfusion was restored and the ECG reverted to normal

Catecholamines particularly noradrenaline have been shown to raise the threshold for VF in hypothermic dogs [30] This protective effect was attributed to a rise in blood pressure rather than to a specific effect on the heart. This was confirmed by Angelakos and Daniels [31] who showed that infusion of noradrenaline or dopamine reduced the incidence of VF in hypothermic dogs from 60 to 20% and the LT_{50} from 19 3 to 12 5°C

There is ample evidence that catecholamine secretion is greatly enhanced in humans immersed in cold water [32–35] There may be a possibility that in the pre-rescue phase conscious awareness of imminent rescue can reduce sympathetic tone or catecholamine secretion and thus their protective effect

Collapse during rescue

Hypothesis I The after drop

The experimenters at Dachau reported deaths occurring after victims had been removed from cold water and attributed these to the after drop in core temperature which they had also observed [12] They attributed the after drop to return of cold blood from periphery to core as the peripheral circulation re opened on re-warming. They observed that the incidence of collapse and death roughly coincided with the nadir of the after drop On this explanation if a victim was, for example within 2°C of a lethal core temperature on removal from the water

the after drop would bring the core temperature to the lethal level

This explanation was widely quoted and accepted [36 37] The Duchau experimenters however made no effort to differentiate between early and late deaths While their explanation might be credible in the context of their experiments it is not consistent with accounts —anecdotal but not isolated—of individuals collapsing while assisting in the rescue process To be able to do this they must have been conscious and active which means that their core temperatures must have been above 30°C and probably above 33°C the after-drop is typically 1–2°C and the Duchau records show that death usually occurred at around 25°C

The after drop hypothesis for rescue collapse proposed by the Duchau experimenters went unchallenged for many years until Golden & Hervey[1 38] demonstrated that it was not necessary to invoke any physiological events to explain the after drop An after drop is an inevitable consequence of the physical laws of heat flow in a structure, such as the body that comprises a heat producing core surrounded by an insulating shell if it is immersed in water at a temperature at which heat loss to the water exceeds heat production and then moved to a warmer environment Webb[39] subsequently confirmed this.

Although indirect evidence for a possible cold bolus effect in some circumstances has been reported [40] Golden described experiments with pigs in which the recording system was shown to be capable of detecting even a small cold bolus of blood returning to the heart [41] no evidence of any cold bolus was found when rescue and re-warming were simulated by transferring the anaesthetised animals from cold to warm water

In any case it is not clear how a cold bolus of blood could account for the anecdotal reports of a transient loss of consciousness seen in some survivors.

Hypothesis II Collapse of arterial pressure

An alternative explanation would therefore seem to be required for Rescue Collapse It is conceivable that a similar mechanism to that outlined for Pre Rescue Collapse may also contribute to Rescue Collapse particularly in those individuals who have only been immersed for a short period of time The reported duration of immersion in these victims differs little from that of many subjects in laboratory studies in whom collapse has not been recorded This leads to the suspicion that the physiological consequences of the greater levels of anxiety which must be present in the real situation contribute to the subsequent collapse

Following prolonged immersion a number of other factors come into play at the time of rescue that alone or in combination clearly can cause sudden and dramatic changes in cardiovascular function We shall argue that their likely effects are consistent with the pattern of circum-rescue collapse as seen in the anecdotal evidence It is also of interest that the central concept of failure to maintain arterial blood pressure can explain loss of consciousness followed by recovery this may be due to inadequate cerebral oxygenation recoverable when the situation improves (in contrast to the irreversibility of VF)

The factors which have been identified on the basis of the anecdotal evidence include (i) immersion (ii) removal from the water (iii) the restoration of the full influence of gravity (iv) hypovolaemia (v) hypothermia (vi) physical effort at the time of rescue Although listed separately they are linked and when present in combination are mutually reinforcing

When a subject is immersed in water the blood in extrathoracic vessels is surrounded by a medium of approximately the same density and becomes effectively weightless Hydrostatic compression reduces venous capacitance in the dependent parts of the body The increase in ambient pressure with depth causes a negative intrathoracic pressure typically around 15 mm Hg during upright seated head out immersion in thermoneutral water[42 43] this effect is greatest when the body floats vertically and least when it floats horizontally in the water

These changes have characteristic physiological consequences The most significant is redistribution of blood to the upper part of the body This takes place almost immediately on immersion to the neck in the upright position and is the major physiological change in immersion in thermoneutral water Central blood volume increases by up to 700 ml[44–46] In cold water vasoconstriction further increases the shift of blood from the peripheral circulation to central vessels

On immersion removal of the gravitational effect and its replacement by a positive hydrostatic pressure gradient reduces the demand for work by the heart particularly in supplying the cerebral circulation while the shift of blood to central vessels together with the hydrostatic effect facilitates cardiac filling Cardiovascular

changes observed in man during resting, head out upright immersion in thermoneutral water include increase by 12 18 mm Hg in right atrial pressure[44,45,47] increase by 250 ml in diastolic filling,[44] and increase in cardiac output by 32–66%.[42,45,47] The increase in cardiac output was described as attributable to increase in stroke volume there being no change of consequence in heart rate*

The shift of blood to central vessels during immersion evokes diuresis[48,50] and eventually hypovolaemia. The body appears to sense the initial over filling of the central vessels and to interpret it as indicating excess total blood volume Subjects immersed upright and head out in thermoneutral water may secrete 350 ml urine per hour.[51] In cold water peripheral vasoconstriction exacerbates this effect If severe hypothermia occurs the direct effect of cold diminishes tubular reabsorption in the kidney shifts of fluid from intravascular to interstitial and intracellular compartments further deplete circulating volume This may cause severe hypovolaemia in immersion victims.[51]

When a subject is lifted out of water after prolonged immersion the hydrostatic assistance to circulatory function is lost and the full effects of gravity are again applied to the body In the usual vertical posture more work is required to lift blood to the head at the same time gravity induced pooling of venous blood in the lower limbs diminishes venous return Blood volume may be severely depleted In normal circumstances reflex adjustments act to maintain cardiac output and arterial pressure in the combination of adverse circumstances that occur in rescues this may be impossible

There is evidence from experiments with animals that baroceptor reflexes are impaired by moderate hypothermia.[51] This would add an important harmful effect to the factors already described Even if the reflex controls are working normally they call for more cardiac work and so for greater oxygen supply to the myocardium Increased heart rate decreases the time for coronary filling and this may not be tolerated by a cold heart Increased blood viscosity further increases the demand for cardiac work and reduces coronary perfusion

Yet another factor that can greatly increase the demands on the circulation at a time when it may already be difficult to meet them is the physical effort involved in attempts to assist in rescue by swimming climbing and so on Although the muscle pump should fractionally assist the heart opening up of the potentially huge vascular bed in muscle calls for correspondingly increased work by the heart and in turn for oxygen supply if the heart cannot do the extra work arterial pressure inevitably falls Pre-existing coronary disease clearly adds another factor that can threaten myocardial oxygen supply in the circumstances of rescue

We consider that the evidence and arguments presented strongly support the hypothesis for the mechanism of circum rescue collapse first advanced by Golden[1,41] as an alternative to the after drop and cold boils mechanisms This postulates that the sudden deterioration in a survivor's condition is caused by collapse of arterial blood pressure

In summary the circulatory collapse can come about as a result of a number of factors primary among these are loss of hydrostatic assistance to venous return and reimposition of the effects of gravity hypovolaemia increased blood viscosity diminished work capacity of the hypothermic heart and reduced time for coronary filling dulled baroceptor reflexes unmeetable demands to perfuse skeletal muscle psychological stress and pre existing coronary disease

Death probably occurs as the result of inadequate blood supply to heart or brain Myocardial ischaemia is likely to cause irreversible VF The outcome of cerebral ischaemia may be more variable It may account for cases where the subject recovers after a spell of unconsciousness it may be significant that such recoveries seem to occur once the subject is horizontal and at rest Alternatively recovery from cerebral ischaemia may not take place There is a further possibility that those who lose consciousness

*Footnote: A physiologist might point out that normally events in the heart affect than failure to pump out the volume of blood returned to it cannot alter cardiac output other than momentarily Output is adjusted to match venous return and this as long as arterial pressure is constant is determined by peripheral resistance output in excess of venous return would simply deplete central reservoirs and then cease In adverse circumstances however maintenance of cardiac output and arterial pressure are under threat the interrelationships become more complex and the heart's action becomes limiting. Factors that facilitate filling are then valuable in themselves and increase myocardial contractility through the Frank-Starling mechanism output arterial pressure and venous return are improved together

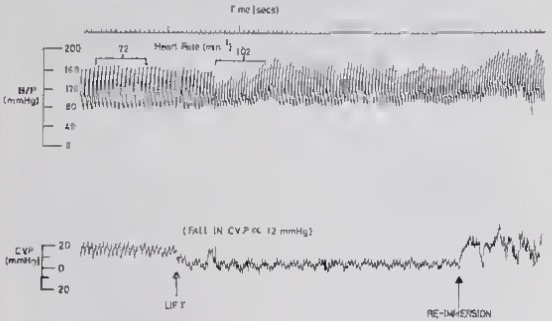

Fig 2 Changes in the aortic (B/P) and central venous pressure (C V P) during vertical lifting by helicopter strop from water at 15°C (n = 1)

while climbing nets or ladders will fall back into the water and drown.

The variability in the incidence of Rescue Collapse may be explained by the variation in the susceptibility of individuals to cooling and/or differences in the state of health of their coronary arteries

EXPERIMENTAL EVIDENCE

There are severe problems in subjecting such a hypothesis to experimental test Real rescues are diverse and uncontrolled and there is no possibility of making the necessary measurements Experiments on human subjects are heavily constrained by ethical considerations and the experiment described below may represent about the limit to what can be done Animal experiments were valuable in investigating the mechanism of the after drop but the requirements for studying cardiovascular events are more critical a species with similar reflex controls and postural habits to man would be needed which suggests one of the higher apes with the practical difficulties that would entail

Nevertheless it was possible to demonstrate the key cardiovascular effects of removal from water in the unpublished pilot study in man shown in *Fig 2* The subject dressed in shorts was lifted vertically from water after immersion for 30 minutes at 15°C. The lift was performed with a single helicopter strop Aortic and central venous blood pressures were recorded throughout immersion and lifting.

As *Fig 2* shows, during the lift central venous pressure fell by approximately 12 mm Hg This we interpret as the consequence of removing hydrostatic support and restoring gravity Aortic pressure fell initially Heart rate increased by 30 beats per minute (40%) This is part of the normal response to fall in systolic pressure In this fit normothermic individual arterial pressure was maintained after the brief fall of the normal regulatory responses were overwhelmed or impaired however the situation would be very different

In view of the implications for rescue techniques studies have been made of the effects of varying these in simulated rescues of human subjects In an unpublished experiment by Golden 17 subjects wearing swimming trunks were lifted from cold water vertically by the standard single lifting strop and more nearly horizontally by a double strop (*Fig 3*) The mean changes in heart rate for each method of lifting are shown in *Fig 4* During vertical lifting mean heart rate increased by 16% this change was highly significant Horizontal lifting caused only a small non significant increase

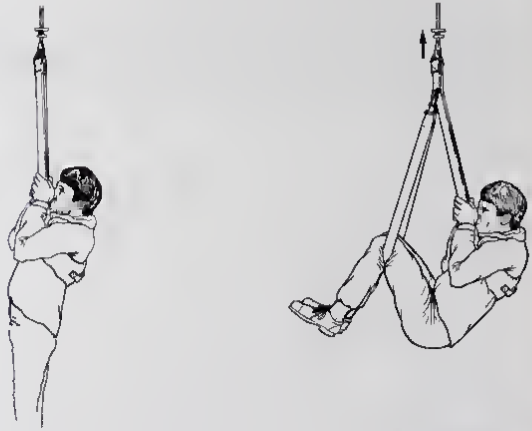

Fig 3 Vertical lift (single strop) and horizontal lift [double strop]

The change in heart rate is an indication of the regulatory response the heart was called upon to make. In situations where the capacity to respond is diminished horizontal lifting would clearly be preferable

Golden's work has been extended by Tipton & Vincent[2] to cover subjects wearing normal and protective clothing. *Figure 5* shows the mean changes in heart rate In all clothing assemblies heart rates were again found to increase significantly more during vertical than during horizontal lifting.

In interpreting these results it must be borne in mind that the clothing assemblies affected body temperature In water at 5°C when normal clothing was worn mean body core temperature had fallen by 1 1°C at the time of lifting in the wet suit by 0 7°C and in the dry suit by only 0 2°C The difference between vertical and horizontal lifting was greatest when the subjects wore the dry suit and thus had the highest core temperatures This may possibly have been because peripheral venous capacitance was reduced when they were cold and this decreased the scope for gravitational redistribution of blood Only in the dry suit were the subjects horizontal while in the water—due to air trapped in the suit—so there was no hydrostatic element in this situation and it should follow that the change in heart rate reflected only the baroceptor response to the change in posture

PRACTICAL CONCLUSIONS

It follows from the suggested mechanism for circum-rescue collapse that the transition from water to air is likely to be least traumatic in subjects who are lifted horizontally after floating horizontally during immersion The effects of loss of hydrostatic support and exposure to

Fig 4 Average percentage changes in heart rate after one minute horizontal and vertical lifts (n = 17)

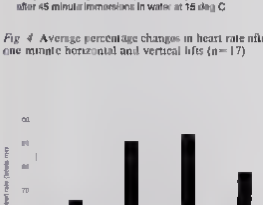

Fig 5 Average heart rates during one minute lifts following immersion in water at different temperatures and with different clothing (n = 18) Normal clothing cotton underwear woollen socks and pullover and a cotton boiler suit Wet suit = normal clothing + a trunk and mitts wet suit Dry suit = normal clothing + a whole body watertight suit leaving only the hands (wet suit gloves worn) and face exposed □ = horizontal lift ■ = vertical lift

gravity will be most severe in those lifted vertically after floating vertically

Protective gear tends to encourage horizontal flotation this applies for example to aircrew wearing immersion coveralls submariners in Submarine Escape Immersion Suits and also to survivors lying on the floor of a liferaft It also prolongs the possible duration of survival During a lengthy flotation however a subject in protective clothing may become profoundly hypovolaemic as well as eventually hypothermic Thus in real life subjects who are found floating horizontally may be at as great or greater risk of circum rescue collapse than those floating vertically who probably have less protection from cold and have been floating for a shorter length of time The latter however are the more at risk from loss of hydrostatic support.

The conclusion is absolutely clear that removal from water in the horizontal posture is preferable in all circumstances if it can be achieved It also appears very likely that any demand for physical effort on the part of the victim at the time of rescue carries a risk of precipitating collapse and death With the inevitable proviso circumstances permitting immersion victims should be handled with the utmost gentleness and as the potentially critically ill patients that they are We fully endorse and approve the efforts now being made in many quarters to modify rescue techniques to meet these principles and so improve the prospects for survival

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Ventilation with isoflurane in the Triservice anaesthetic apparatus: a comparison with halothane and trichlorethylene

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Abstract

Recovery from anaesthesia using the Triservice anaesthet c apparatus w th either isoflurane sl ne or halothane and trichlorethylene was assessed by measurement of reaction time There was no statis t cally significant improvement in recovery between patients who received low concentrations of isoflur ane and those who rece ved halothane and trichloro thylene

The mean prefibu of systolic pressure and heart rate were s gnificantly greater in the isofluorane group (P<0 05) than in the halothane/trichlorethylene group Cardiovascular stab lity was maintained into the recovery period The benefits of low concentra tions of isoflurane as sole agent in the Triservice anaesthetic apparatus and their extrapolation to a shocked casualty in a military setting are discussed

INTRODUCTION

The reliability of the Triservice anaesthetic apparatus (Penlon Ltd Abingdon England) has been attested to in previous papers [1,2] Renewed interest in the use of this apparatus was stimulated by the Falklands conflict of 1982 [3,4] where space for surgery and anaesthesia was minimal and facilities for preoperative monitoring were basic. In the anaesthetic management of shocked patients undergoing battle surgery in this environment the need for techniques ensuring cardiovascular stability was paramount Similarly the time and resources available for the treatment of anaesthetic complications were minimal For these reasons spinal and epidural anaesthesia were not advocated and the Triservice anaesthetic apparatus was used for general anaesthesia in both spontaneously breathing and ventilated patients In this case the benefit of a short recovery time would greatly improve the throughput of casualties and minimise their dependence on recovery staff

Halothane and trichlorethylene are the agents traditionally used with the Triservice anaesthetic apparatus in two inline Oxford miniature vaporisers as originally described in 1968 [5] but these agents are less than ideal Trichlorethylene although a good analgesic is prone to cause cardiac dysrhythmia and raise intracranial pressure [6] The high fat solubility of trichlorethylene would tend to delay its elimination [7] and hence delay recovery Halothane is an unsuitable agent for multiple anaesthetics [8] yet battle casualties often require a series of operations at points along the evacuation chain towards eventual repatriation [3] Halothane also raises intracranial pressure [6,9] and causes cardiac dysrhythmia and a fall in arterial pressure by myocardial depression [10] In contrast isoflurane is mostly excreted unchanged [11] causes minimum cardiac dysrhythmia and in the absence of respiratory depression causes the least increase in intracranial pressure compared

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with halothane and enflurane. It would seem to be an ideal agent to substitute in the Triservice anaesthetic apparatus.

The aim of this study was to assess the rate of recovery from anaesthesia maintained using low concentrations of isoflurane as sole agent in the Triservice anaesthetic apparatus and its suitability for military field use. In healthy subjects the heart rate and arterial pressure responses to anaesthesia and the postoperative arousal state were measured. These were compared in patients receiving halothane and trichlorethylene at concentrations conventionally used in the Triservice anaesthetic apparatus for military anaesthesia with those receiving isoflurane at low concentrations.

METHODS

The trial was approved by the hospital ethics committee. Twenty-nine patients presenting for operation consented to participate. Patients were randomly allocated to one of two groups. Group A received halothane/trichlorethylene and group B isoflurane alone. This was the only detail in which the two groups differed. All subjects were ASA 1 male caucasian service men aged 18–40 years presenting for elective surgery to the lower limb.

At the preoperative visit a control period of reaction time was recorded using a small portable cassette recorder modified to record the patient's speed of reaction to a light emitting diode display counting in milliseconds. The count commenced at pseudorandom time intervals between 2 and 10 s and was terminated by the patient pressing a button. The time was automatically recorded on the tape. The test continued for 4 min during which between 35 and 50 individual reaction times were recorded. Each patient received approximately 0·25 mg/kg to the nearest milligram of papaveretum by intramuscular injection approximately 1 h before operation.

Baseline measurements of arterial pressure and heart rate were recorded for 15 min before the start of surgery using a Datascope Accutorr 1 automatic arterial pressure analyser. Anaesthesia was induced in theatre with 5 mg/kg thiopentone and paralysis provided by vecuronium 0·1 mg/kg after calibration of a Datex relaxograph recording from the hypothenar eminence with train of four stimulation of the ulnar nerve at the wrist. The patient was hand ventilated until intubation, with a Laerdal self inflating bag and mask connected to the Triservice anaesthetic apparatus. Oxygen-enriched air was used with 1% halothane and 0·5% trichlorethylene from two in line Oxford miniature vaporisers for group A patients or 1% isoflurane in a single vaporiser for group B patients. Intubation was carried out between 2 and 4 min after induction when at least 30% T_1 was reached. The ventilator a Cape TC50 situated between the patient and vaporiser(s) was initially set to deliver a tidal volume of 10 ml/kg and 10 breaths/min.

Calibration of each of the Oxford miniature vaporisers was checked at the start of the trial. Fractional inspired oxygen concentration (FiO_2) was measured using an Instrumentation Laboratory 404 polarographic oxygen meter checked against air and 100% oxygen before use. Oxygen was supplied by a standard Boyle's machine to give a FiO_2 of at least 0·3 measured before the Laerdal expiratory valve attached to the endotracheal tube. The vaporisers were filled at the start of each procedure and all the apparatus was primed with anaesthetic vapour by squeezing the bag before induction. None of the vaporisers needed refilling during the operation.

End tidal carbon dioxide ($PetCO_2$) was measured using a Hewlett Packard CO_2 analyser Model 47210A calibrated before each case. Ventilation was subsequently adjusted to keep the $PetCO_2$ between 34 and 36 mmHg. When a stable $PetCO_2$ had been achieved (by 15 min after induction) there was no further alteration of minute ventilation.

Arterial pressure, heart rate, $PetCO_2$, respiratory rate and tidal volume were measured at 5 min intervals and surgery commenced only after the third (10 min) reading. Additional relaxation was provided with supplemental vecuronium (1–2 mg) to maintain T_1 less than 25%. Neuromuscular blockade was reversed with neostigmine 2·5 mg and atropine 1·2 mg and extubation occurred with T_1 75% of baseline or T_1 50% with TR ratio (T_4/T_1)>75% in all cases.

At the end of the operation the patient was transferred to the recovery area where arterial pressure and heart rate were measured at 2·5 min intervals. When able to give name, rank and number the patient's reaction time was measured. This was repeated again at 1 and 4 h after surgery.

Statistics

The Kolmorgorov Smirnov two-sample test[12] was used to assess distributional differences between the two groups. The anaesthetic trial

corresponded to a two-factor repeated measure on one factor design (described in Winer[13]) with the patients being monitored preoperatively and operatively The analysis of this design depends on various statistical assumptions being satisfied i e

1 The covariance matrices are homogenous between groups
2 The pooled covariance matrix has compound symmetry

Where the compound symmetry requirement is not met the Greenhouse Geisser procedure[14] can be employed Analysis of variance methods have been conducted using a Genstat language to test assumptions The hypotheses under consideration were whether or not the mean profiles of arterial pressure and heart rate were different for the two groups The Scheffe method of multiple comparisons was used to assess any significant findings Transformations of the data have been considered where the statistical assumptions in the repeated measures analysis of variance method need to be fulfilled e g angular transformations used on percentage data on reaction times

Reaction time data was logarithmically transformed for analysis and percentage of reaction times >250 ms or >500 ms compared for the two groups on each of the four occasions tested

RESULTS

Of the 29 patients seven were not included in the analyses because of limited data collection perioperatively (anaesthetic time less than 35 min or surgery times under 15 min) Ten patients received halothane/trichlorethylene and 12 patients isoflurane The distribution of patients characteristics was not significantly different between the groups for the variates listed in *Table I* Further analgesia was required in the postoperative period by six of the ten patients who received halothane/trichlorethylene and seven of the twelve patients who received isoflurane alone There were no occurrences of awareness in either group during anaesthesia

Reaction times for both groups were considerably slower in recovery and 1 h after operation ($P<0.05$) and were within 20% of control values by 4 h post-operatively (*Table II*) The proportion of reaction times above 250 ms and 500 ms were also significantly different ($P<0.01$) between control and post operative phases However the percentage of reaction times 250 ms and 500 ms was not significantly different for the two groups

Tables IIa IIIa and IVa provide some approximate standard errors of two means according to a comparison between halothane/trichlorethylene or isoflurane at any time point or a comparison between two time points for any one group

The main statistical analyses are depicted in *Tables III* and *IV* and relate to the patterns of arterial pressure and heart rate at the following times

Time period

1 The time nearest to 5 min before induction
2 At induction
3 10 min after induction
4 The first time point after start of surgery
5 15 min after period 4 or 5 min before period 6 if surgical time was short
6 Just before the end of surgery
7 During the reversal phase
8 The first time point in recovery
9 5 min after period 8

Anaesthetic vapour concentrations were constant for periods 4 5 and 6 Period 7 started when the relevant vaporisers were switched off at a time judged to be close to the end of surgery

The mean profiles of the two groups of patients were significantly ($P<0.05$) different for systolic pressure with halothane/trichlorethylene patients showing a reasonably constant level across time after an initial decline whilst the isoflurane patients showed a steady increase across time after an initial fall during induction (period 2)

The mean profiles for mean arterial pressure were not significantly different although mean pressure was not constant across time (early decline during induction phase a rise during recovery) Large fluctuations were found in some patients across time—mainly occurring 10 min after induction and in recovery (time periods 3 and 8) The mean profiles for diastolic pressure were not different and did not vary with time Again some patients had large fluctuations of pressures mainly occurring in time periods 3 and 8

There was some indication of differences in mean profiles for heart rate with significant differences ($P<0.05$) in average heart rate across time (lower heart rate during surgery compared with induction/recovery phases) Some patients showed large fluctuations in

Table I Patient variables and time intervals for ten halothane/trichlorethylene (group A) and 12 isoflurane (group B) patients

	Group A		Group B	
	Mean	Range	Mean	Range
Age (years)	25	20–36	25	18–38
Weight (kg)	78	67–96	80	67–93
Premedication (pipavaretum) (mg/kg)	0·278	0·223–0·312	0·282	0·253–0·307
Time between premedication and induction (min)	78	54–102	74	54–91
Induction dose (thiopentone) (mg/kg)	5·12	4·79–5·56	5·12	4·68–5·38
Induction to start of surgery (min)	13	9–18	16	11–23
Operative time (min)	39	18–58	31	15–55
Anaesthetic time (min)	53	30–80	51	30–70
Analgesia (time first required after operation) (min)	165	24–587	260	11–1110

Table II Average reaction times for Group A and Group B patients

	Group	Control	Recovery	1 Hour	4 Hours
Mean (ms)	A	226	660	331	267
	B	238	378	269	264
Percentage					
250 ms	A	17	71	55	49
	B	24	62	40	36
500 ms	A	0·4	16·5	3·1	2·7
	B	1·2	12·9	3·0	3·3

Ile Approximate standard error of difference of two means

	Between any two time points for one group		Between Group A and Group B at any but same time
	Group A	Group B	
Mean reaction time	7·3	6·6	7·6
Percentage 250 ms	7	7	8
Percentage 500 ms	2·9	2·6	3·0

Table III Average values of arterial pressure and heart rate for Group A and Group B patients

Time period	Group A Syst/Diast (MAP)	HR	Group B Syst/Diast (MAP)	HR
1	130/78 (95)	76	129/79 (101)	70
2	119/70 (90)	75	126/80 (96)	91
3	124/78 (95)	72	115/74 (90)	79
4	120/76 (91)	82	113/80 (94)	73
5	118/73 (90)	52	123/78 (95)	69
6	119/76 (93)	59	129/79 (98)	75
7	117/71 (91)	59	133/82 (102)	80
8	125/75 (101)	78	133/82 (105)	76
9	120/72 (89)	64	125/82 (103)	69

Syst/Diast (MAP) = Systolic/diastolic (mean arterial pressure)
Time periods are as described in the text

IIIa Approximate standard error of difference of two means

	Between any two time points for one group		Between Group A and Group B at any but same time
	Group A	Group B	
Systolic	5	5	7
Diastolic	5	5	8
Mean arterial pressure	5	5	6
Heart rate	6	6	8

Table IV Average values of $P_{ET}CO_2$, FiO_2 and inspired concentration to MAC ratios (MAC ratio) for Group A and Group B patients

Time period		3	4	5	6	7
$P_{ET}CO_2$ (mmHg)	Group A	36 9	35	34 6	35 5	35 5
	Group B	36 7	34 8	35 6	36 8	36 7
FiO_2	Group A	0 362	0 321	0 328	0 321	0 319
	Group B	0 329	0 328	0 318	0 311	0 317
MAC ratio	Group A	2 63	2 15	2 40	2 17	
	Group B	0 80	0 69	0 67	0 60	

Time periods are as described in the text

IVa Approximate standard error of difference of two means

	Between any two time points for one group		Between Group A and Group B at any but same time
	Group A	Group B	
$P_{ET}CO_2$	1 1	1 0	1 1
FiO_2	0 015	0 013	0 017
MAC ratio	0 15	0 13	0 16

heart rate with much higher values during induction and/or recovery phases, while some patients showed small movements across time

There was no difference between profiles for the two groups for $P_{ET}CO_2$, although across all patients there was a fall after induction and a

rise towards the end of surgery and into the reversal phase This reflected the way in which ventilation was controlled FiO_2 was consistently kept above 0 3 in all cases with no difference in mean profiles between the halothane/trichlorethylene and isoflurane groups

The inspired concentration to MAC ratio was calculated for each group by dividing the percentage of vapour as selected on the vaporiser by the corresponding MAC value in oxygen (halothane 0 8 trichlorethylene 0 17 isoflurane 1 15) These values were significantly higher ($P<0 01$) for the halothane/trichlorethylene group than for the isoflurane group during surgery from 10 min after induction However the low MAC for trichlorethylene in relation to the relatively high concentrations of agent used (0 5%) results in a disproportionately greater ratio for halothane/trichlorethylene compared with the inspired concentration to MAC ratio for isoflurane As the blood gas coefficient for trichlorethylene is high (9 2) the correlation between alveolar concentration and inspired concentration will be poor for most of the operation and equilibrium may not even be achieved by the end of surgery The significance of these inspired concentrations to MAC ratio comparisons should therefore be viewed in this light

DISCUSSION

In a military setting it is desirable to have a fully co operative patient as soon after surgery as possible The unprepared simple reaction timer as designed by Wilkinson and Houghton [15] was used in this trial to assess patient arousal as a marker of patient co operation A similar test was used to assess vigilance after ingestion of chlorpheniramine [16] but this is the only other occasion known to us on which reaction time was used to test the effects of a depressant drug on arousal It was hoped to demonstrate an improved recovery with isoflurane but although a trend in this direction was noted there was no statistically significant difference between the two groups studied Kocan [17] using different criteria for recovery was also unable to find a difference although his isoflurane group received trichlorethylene in addition Two possibilities exist that the different agents used even at different concentrations allow no difference in recovery rate or that a patient s reaction time is an inappropriate index for the recovery we were interested in The cumulative effects of repeated anaesthetics in a short time may well exaggerate any improvement in arousal using isoflurane but this still may not become clinically apparent However the results of this trial indicate that between 1 and 4 h post operatively it can be expected that the patient would co operate in an emergency

Both the heart rate and systolic arterial pressure profiles were greater in the patients who received isoflurane compared with patients who received halothane/trichlorethylene and these pressures were sustained into the recovery period. These differences could be due to inequality of pre-operative analgesia of surgical stress or of ventilation oxygenation or anaesthetic depth or to a qualitative difference between the anaesthetic agents involved As there was no significant difference between the groups for the dose of papaveretum or the time that it was given preoperatively the difference in cardiovascular profiles may be explained by a lesser analgesic potency of isoflurane Trichlorethylene (5%) and 50% nitrous oxide in oxygen were subjectively assessed by obstetric patients to give equal analgesia [18] However blood levels rise only slowly during ventilation with 0.5% trichlorethylene[7] as used during this study Hicks *et al*[19] found 0 2–0 7% isoflurane in oxygen for patients in the second stage of labour to have an analgesic effect equal to that of 40% nitrous oxide in oxygen after 10 min The relative analgesic potencies of isoflurane and trichlorethylene have not been directly compared but from the above two studies the intraoperative analgesic effects of trichlorethylene and isoflurane in the concentrations used in our study would be comparable albeit with a slower onset of effect with trichlorethylene

The types of operation and their duration were comparable Ventilation was controlled whereby there were no significant differences in $PetCO_2$ between the groups and both groups received at least 30% oxygen so that in healthy subjects comparable oxygenation can be inferred

In a study of 15 children isoflurane in oxygen and halothane in oxygen in equipotent end tidal concentrations were found to lower the arterial pressure equally with no significant change in the heart rate for either group [10] The observed difference in arterial pressure between the two groups of patients in our trial may therefore be due to differences in the depth of anaesthesia despite reservations on the comparison of inspired concentration to MAC ratios

The concern in this trial was that the benefit

of improved recovery time should not be offset by awareness or unfavourable cardiovascular parameters intraoperatively or by increased analgesic requirements postoperatively consequent upon light anaesthesia.

The isoflurane patients maintained stable cardiovascular variables throughout the operation and sustained these into the postoperative period. This is a desirable feature in a military setting where patients may be considerably hypovolaemic before surgery and the further insult of cardiac depression by anaesthetic agents in a partially resuscitated patient could be dangerous. However those casualties requiring anaesthesia without the benefit of analgesia beforehand would need higher anaesthetic concentrations of isoflurane to avoid awareness and excessive sympathetic activity. The capacity of the Oxford miniature vaporiser would be a limitation in this setting. This trial did not address this problem.

A proportion of military patients requiring surgery for injuries caused by blast will have a concomitant head injury and isoflurane delivered at one MAC has been shown to cause a smaller rise in intracranial pressure than halothane at a $PaCO_2$ of 35 mmHg in dogs[4,9]. Similar conditions concerning MAC and $PaCO_2$ are likely in our study (*Table III*) such that a protective effect on intracranial pressure can be inferred.

One possible disadvantage alluded to in the paper by Tighe and Pethybridge[20] concerns the coronary steal phenomenon as originally investigated by Buffington *et al*[21] and Bekker [21]. The likely sparsity of coronary vascular disease in military subjects would help protect against this phenomenon. Similarly the higher arterial pressures and heart rates in the isoflurane group would be tolerated by a cardiovascularly hypovolaemic at the depths of anaesthesia used in our trial.

It would not be ethically possible to conduct a similar study on hypovolaemic patients nor would the degree of hypovolaemia be easy to quantify. However the tenets of adequate preoperative resuscitation balanced against surgical urgency still holds in a military field hospital and so the results of this trial are still of relevance for such a setting. In conclusion, patients ventilated using low concentrations of isoflurane in draw-over apparatus maintained a stable cardiovascular state into the recovery period. Despite there being no improvement in recovery rate after isoflurane patients were usefully alert within 4 h after surgery. Other properties of isoflurane make it a suitable anaesthetic for ventilation in a military field setting.

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The hazards of operational diving in heavily oil-polluted water

K A Peterson and S J Portouw

Abstract

The war in the Gulf and the resultant massive oil spill has prompted an assessment of the health hazards to naval divers operating in an oil fouled environments A review of current literature and discussions with experts in the field was undertaken to assess these hazards With the assistance of Kuwait Petroleum an assay of the content of average Kuwait crude was obtained The risks of contact with crude oil and its vapours via the skin inhalation and ingestion have been assessed Contact dermatitis is the most likely sequel A chemical pneumonitis from oil inhalation is possible but extremely unlikely A health risk from ingestion of crude oil is equally unlikely since no toxic effect is thought to occur below a consumption of 5 ml/kg (350 ml for an average diver) Trace metals were found to be at a level at less than 1/10 of the mineral toxic dose for all but vanadium No increased risk of skin cancer can be found in animal studies of crude oil Epidemiological studies have recorded no increased risk of bladder or thyroid cancer in petroleum workers but an increase in lung nasal cavity sinus and skin cancer has been shown following chronic exposure to low levels of petroleum vapour No medical indication was found for modification of existing operational procedures although since the toxicity of some components of crude oil is unknown the use of improved equipment to avoid contact should be studied

INTRODUCTION

The events in the Persian Gulf at the beginning of 1991 led to what was probably the world's largest ever oil spill On 16 January 1991 the allied air bombardment of Iraqi positions began Intelligence reports at this time noted eight tankers filled with oil off the coast of Kuwait By the end of the war four of these tankers were damaged by allied bombing and were empty Additionally the Iraqis had released large quantities of oil from Kuwait's Sea Island tanker terminal This huge oil spill travelled through the Gulf and contaminated about 100 miles of the Saudi Arabian coastline Although it was initially estimated that ten million barrels had been spilled a more recent estimate by the Meteorological and Environmental Protection Agency (MEPA) was of a spill of between 3–5 million barrels of oil Clean-up teams were initially recovering 30 000 barrels of oil every day from the surface of the spill[1] These oil contaminated waters had also been mined by the Iraqis Many of these mines particularly those in shallow water required clearance by divers

In the light of these events an evaluation of the risk to naval divers operating in an oil fouled environment was required A review of current literature and interviews with experts in the field were conducted to assess the toxicity of crude oil via ingestion inhalation and dermal contact The hazards of each route of exposure were addressed individually Contaminants specific to Kuwaiti crude oil were also addressed

THE COMPOSITION OF CRUDE OIL

The components of Kuwaiti crude oil and the trace contaminants therein are numerous (*Tables 1 and 2*) Crude oil is a complex mixture of hydrocarbons and trace metals The long chain aliphatic hydrocarbons are generally benign yet several of the components are of

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concern particularly toluene benzene and the polycyclic aromatic hydrocarbons (PAHs) Fortunately the concentration of PAHs in crude oil is very low The concentration of benzo(a)pyrene a PAH in Kuwaiti crude oil is approximately 0 45 g/tonne Most PAHs are formed in the refining process during catalytic cracking in the high boiling fraction [2] The low concentration in crude oil has not been shown to increase cancer risk appreciably [3 10] As shown in *Table 1* the concentration of benzene and toluene is much higher than the threshold limit values recommended This is due to these figures being derived from the vapour pressure at temperatures of 60–70°C and at concentrations found at the distillation site where they would be maximally concentrated The levels of these substances found after an oil spill above the ocean surface at lower temperatures and in open air is not known but is an area of active research It is considered that it would be lower than the threshold limit values Both benzene and toluene are highly volatile and their concentration will diminish quickly in an open air environment. Some of the components of crude oil are partially soluble in sea water and will consequently dissolve in time This poses a different hazard to divers in that they may be exposed to hydrocarbon saturated water as well as oil itself It is extremely unlikely however that toxic concentrations of these substances would ever be encountered since they are poorly soluble The number and concentrations of heavy metals that are in Kuwait crude oil are shown in *Table 2* They are not thought to present an increased health risk to divers from limited exposure The most hazardous of these heavy metals are nickel (a sensitiser) and vanadium both of which are major causes of contact dermatitis Additionally vanadium can cause eye skin and respiratory irritation depending on the mode of contact Vanadium however causes no permanent damage and is not recognized as being mutagenic or carcinogenic to man [4] Nickel on the other hand is carcinogenic and exposure to this substance should be minimized

DIVING CONDITIONS

Royal Navy divers and physicians working with the divers in the Gulf have described the following diving conditions The divers wore either light weight dry suits or wet suits Light cotton disposable overalls were worn over the wet suits together with plastic gloves in an attempt to reduce the extent of exposure to the oil contaminated water Royal Naval divers were also equipped with hoods and the standard face mask of their DSSCCD diving set Many divers were also equipped with AGA face masks a self-contained fully sealed unit designed for special diving situations Overall divers were fairly well protected from long term exposure to the polluted water (T Tempest K Page personal communication) As the water temperatures rose in the warmer months fur

Table 1 Composition of crude oil (1)

Constituent	Threshold limit values+	Concentration in crude oil	
1 Benzene	0 1ppm	*1 2000 ppm *2 13500 ppm	Increased risk of CA Acute headache dizziness nausea convulsion coma death
2 Toluene E	100–200 ppm	*1 600 ppm *2 1400 ppm	Acute eye respiratory dermal irritation CNS toxicity Chronic dermatitis

+TLV refers to airborne concentrations of substances and represents conditions under which nearly all the workers may be exposed for a normal 8 hour day and a 40 week without adverse effects [4]

*1 and *2 Parts per million generated a 60 70°C and in the light and heavy fractions of Kuwait Crude This would be much lower at a temperature of 24°C [1]

Table 2 Composition of crude oil (2)[11]

Constituent	Concentration in crude oil	Toxicity
1 Aluminium	1 ppm	Skin mucous membrane irritation
2 Calcium	10 ppm	
3 Iron	6 ppm	Chronic pulmonary irritation siderosis
4 Nickel	8 ppm	Contact dermatitis respiratory irritation pulmonary disease CA
5 Silicon	2 ppm	Respiratory irritation
6 Sodium	15 ppm	
7 Vanadium	29 ppm	Respiratory irritation eye skin irritation

There were no parts quantifiable of beryllium chromium copper magnesium tin tungsten or zinc

ther modifications to the diving equipment were needed in order to reduce the additional burden to the diver These modifications meant a reduction in the equipment worn in order to combat the higher temperatures and thus an increase in exposure to any contaminant that remained in the area. It was noticed that the greatest exposure to oil was from vapour inhalation and skin contact in those who wore wet suits (Tempest personal communication) To minimize skin contamination the Gemini craft transporting the divers were spun around in a circle to create a window in the oil prior to the divers entering into the water Thus exposure to liquid oil occurred most often while exiting from the water and during removal of equipment In addition the divers were frequently splashed with the oil polluted water while in the inflatable craft Significant transdermal absorption of petroleum products given the limited time of contact was considered to be unlikely The porous nature of the wet suit offered little protection to prolonged exposure in heavily contaminated water Cotton overalls used with the wet suit or the dry suit and AGA sets offered better protection and decreased the divers exposure overall than wet suits alone As skin exposure increased dermal absorption became a more important factor A system for detection of residual dermal contamination with petroleum by ultraviolet light, was available using the device Spill Spotter or by use of normal UV light in a dark environment A study[4] that dealt with petrol contamination and its removal showed that routine cleansing removed the oil in all but long and heavy exposures

Ingestion and/or aspiration of petroleum products was unlikely since a full face mask was always worn By using the DSSCCD and full face mask the Royal Navy divers decreased their chance of ingestion of oil-contaminated water Work routines were arranged so that divers were not exposed to either air or oil pollution for more than four to five hours per day This resulted in them being in the water only for short periods of time Exposure to oil contaminated water was also minimized by 24 hour stand-offs between dives and adherence to comprehensive cleaning routines On the average divers were decontaminated within an hour after completion of their mission though times varied in some instances from five minutes to 24 hours (K Page personal communication)

THE HAZARDS OF EXPOSURE TO CRUDE OIL

Skin contamination with petroleum products may result in both acute and chronic complications An acute contact dermatitis commonly occurs The more volatile the petroleum product the more irritating it is and consequently the more likely is dermatitis Petroleum distillates are the second most common skin irritant (*Table 3*) The more frequent and longer dura

Table 3 Ten most potentially irritating solvents in decreasing order of severity[4]

1. Carbon disulphide
2. Petroleum distillates
3. Coal tar solvents (Xylol Tolnol)
4. Turpentine
5. Chlorinated hydrocarbons (Methylene chloride Trichloroethylene Freon)
6. Alcohols (Methyl Ethyl)
7. Glycols (Propylene glycol)
8. Esters (Methyl acetate Butyl acetate)
9. Ketones (Acetone Methylethyl ketone)
10. Dimethyl sulphoxide

tion of exposure the greater the likelihood of developing a reaction Dermatitis refers to inflammation of the skin most often from direct skin contact It is precipitated by irritation or allergy Approximately 80–90% of contact dermatitis cases are secondary to irritation rather than allergy Such is the case with petroleum products Sensitization followed by allergic reaction was rare in divers coming into contact with the oil spilled in the Gulf [3] Contact dermatitis was a common health complaint of those exposed to the oil but this was limited to small areas of the skin and resolved quickly in all cases studied

The chronic effects of skin exposure to petroleum products have been extensively studied In animal studies [8] epidermal cancer has been related to long term skin painting assays with patches of refined oil These studies implicated the PAHs as primary carcinogens Studies[9 10] have also compared fresh engine oil which contains a low level of PAHs with used engine oil which contain a far higher level They show that the used oil was carcinogenic whereas no increased evidence of carcinoma resulted from exposure to fresh oil Since the crude oil spilled in the Gulf contained low levels of PAHs the risk of cancer from this exposure is considered to be very small [15]

The *inhalation of vapours* produced by the oil spill in the Gulf by divers and support personnel was however a major concern Hydrogen sulphide was easily identified by its characteristic smell This very toxic gas is a by product of petroleum production found at the well heads and refineries It also occurs in natural gas Exposure to this substance in high concentrations (70 mg/m^3) may result in syncope respiratory arrest, and death within minutes Lower concentrations can cause irritation of the eyes and throat as well as gastrointestinal complaints Most dangerous are exposures that occur in poorly ventilated confined work spaces or in low-lying areas where pockets of the gas which is denser than air may collect and concentrate Under these circumstances, olfactory sensation may be rapidly lost and this may lead to a potentially lethal exposure to the gas In the operational situation in the Gulf such a lethal concentration was most unlikely yet minor irritation due to hydrogen sulphide did occur To safeguard personnel from the acute irritating effects of hydrogen sulphide exposure was limited to a concentration of no more than 15 mg/m^3 Constant monitoring was necessary where levels might exceed 70 mg/m^3 [3]

The toxicity and narcotic nature of petroleum vapour is directly related to the molecular structure and volatility of the components Generally toxicity is as follows the aromatics are more toxic than the alkenes which are more toxic than the cycloalkanes which are more toxic than the alkanes The smaller and more soluble molecules are more toxic The volatility in general parallels the toxicity with the aromatics being the most volatile The result is that the toxicity of the atmosphere is inversely proportional to the age of the spill The primary components of vaporized petroleum are short chain molecules These short chained carbon units are also a major component of oil vapour The lighter alkanes (paraffins) compose roughly 90% of the vapour [16] In one study mice exposed to 400 ppm and humans exposed to 100 ppm of isoparaffin in air showed no sensory irritation whatsoever Questionnaires given to Royal Navy divers returning from the Gulf that evaluated acute symptoms of mucosal dryness nausea vomiting diarrhoea headache dizziness fatigue inebriation visual disturbances tremor muscular weakness impaired coordination or paraesthesia were all negative [19] It is well known however that exposure to larger

quantities of hydrocarbons through inhalation may result in a chemical pneumonitis Chronic exposure to oil fog (aerosols) has been studied[11] in laboratory rats exposed to light lubricating oil fog (particles 1 micron diameter the optimal size for deposition in the alveoli) at variable concentrations for a fixed period Histopathological changes were noted at all levels (min 0 2 mg/l) with increases in lung weight lavagable fluid and polymorphonuclear leucocyte counts as the concentration of fog increased At levels of 1 5 mg/l an increase in lung weight was noted up to four weeks after exposure There was no change in the total lung capacity vital capacity residual volume diffusing capacity to carbon monoxide compliance and end expiratory volume in most of these groups, however the 1 5 mg/l male rat group showed changes in the end expiratory volume In all exposures of the oil fog mixture the only pathological changes found were those of a mild inflammatory response [11]

The larger carbon chains and PAHs represent a very small fraction of petroleum vapour One study[10] showed that the concentration of PAHs in refined petroleum vapour was less than 2% These components account for the chronic toxicity of vapour exposure and are a major carcinogen of petroleum products Studies of the chronic effects of vaporized petroleum on both animals and humans have shown no increase in the risk of cancer yet insufficient information exists on the long term effects of such exposures to be certain of the risk How ever it is currently thought[11] that low level exposure at worst will result in a mild inflammatory oedema although even this is most unlikely Thus it appears that the hazards associated with inhaling oil vapour as a result of occupational exposure in the Gulf are minimal

Ingestion of large doses of crude oil was unlikely given the equipment used In research conducted on rats the acute LD50 of ingested crude oil was found to be greater than 5g/kg If the results were extrapolated to humans 3500 g for a 70 kg man or approximately 3 5 litres of crude oil would constitute an LD50 [9] Research on the systemic effects of crude oil ingestion has been conducted on ducks using North Sea crude [12] At doses of 5 ml/kg daily increases were noted in thyroid hormone and hepatic cytochrome P-450 levels No toxic effects from these changes were found Extrapolating this data to humans, it is concluded that a 5 ml/kg oral dose over a period of weeks would not produce any toxic effects No other recent studies of the acute ingestion toxicity of crude oil have been reported and data on humans is lacking.

CONCLUSIONS

Given our present state of knowledge the oil spill in the Gulf appears to have posed a very limited threat to the health of divers The most likely problem was a non sensitizing and self limiting contact dermatitis Given the low probability of large skin exposures for extended periods of time and the cost of routine screening we would not recommend large scale use of UV light or Spill Spotter Routine cleaning following diving in oil contaminated waters is advised

Studies have not shown crude oil to be a topical carcinogen but further evaluation is indicated Exposure to hydrogen sulphide resulted in occasional minor irritation but did not reach toxic levels The toxic components of crude oil are also the most volatile and dissipate quickly Consequently the threat diminishes with time There is minimal risk to health arising from acute and chronic exposure to petroleum vapours Ingestion of sufficient quantities of petroleum products to cause harm is virtually impossible given the amount required It is difficult to compare exposure in petroleum industry workers to naval divers to the Gulf due to the prolonged exposure in the former group However epidemiological studies of long term risk show no increase in the risk of bladder and thyroid cancer in petroleum industry workers but an increase in cancer of the lung nasal cavity sinuses and skin [13 14] It is felt that this increased cancer risk is due to the longer duration of exposure to petroleum products and thus is not as great a hazard to divers exposed only for a short time There is at present no medical indication to compromise operational diving requirements in an oil fouled environment

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Fair Dinkum Way-out Woop Woop: the Sydney to Darwin Motor Safari 1990. Part 2

P H Hardy

INTRODUCTION

The Sydney to Darwin Motor Safari is a 6 500 km motorcycle and motorcar race across the Australian Outback. On exchange duties with the Royal Australian Navy I was fortunate in being able to get involved with organising this annual event. I reviewed the medical preparations and some of the injuries encountered during this eight day race or 'raid' in my previous article in the Summer 1991 Journal. In this concluding article to impart a little of the flavour of the Safari, I shall describe an average day and then recount two of the more lasting memories which the event holds for me.

AN AVERAGE DAY

Due to the very nature of the raid, no two days are the same but a distillate of the Safari would run as detailed below.

0500 and awoken by the moving of engines shattering the absolute silence of the Outback. With early morning in coordination you stringle into your clothes and then dismantle the tent. The tents travel on one of the six luxury coaches which ferry the bulk of the support crew from night stop to night stop. These coaches also carry the nursing staff (although in future there are plans to get the nurses to play a more active role in the Safari field). Time for breakfast eaten under the stars. Breakfast is taken early as the caterers also have to pack up and travel on to the next night's stopover in order to re-rig the galley and prepare for 800 hungry and travel weary Safari goers. A cooked meal is available morning and night with packed lunches being provided for snacking during the day.

Then there is 15 minutes to savour the second cup of coffee and to watch the dawn break at 0530. The doctor travelling in the ambulance has long gone as the ambulance will be sprinting ahead to gain some ground on the leading competitors. The doctor rostered for the helicopter will be preparing to lift off at first light, meanwhile those doctors in the sweep vehicles will be enjoying a more leisurely start. They do not commence their day until the last vehicle has left the night campsite.

At the start of the race it takes some two hours between first and last vehicles getting away, but only half this time at the end of the raid when the competitors have been thinned down by breakages, accidents and injuries.

By the time the first competitor is on the course the organisers will already have reconnoitered and traversed the course three times. The last time is for a final check that the tracks are clear with the pre-race scrutineers marking out some of the routes only 6–12 hours before that day's Safari is run.

By 0830 we will have had our first casualty, perhaps a motorcyclist who missed a warning sign and ran into a dry creek at speed. The message is relayed by radio. The helicopter diverts from its aerial photographic session to be first on the scene. Danger—the casualty is

At the time of writing, Surgeon Lieutenant Commander Hardy was appointed to HMAS *Platypus* on exchange duties. He is now appointed to St Georges Hospital, Tooting.

removed from the track and personnel stationed to slow oncoming vehicles racing towards the spot at up to 160 km/hr. Response—yes, he says that he feels fine then airway breathing and circulation are checked. Primary and secondary surveys completed a decision is made that he requires removal from the bush to a major medical centre for further investigation. The helicopter is rigged for its casualty evacuation role. All too aware of the TV video camera monitoring your every move the man is carefully transferred to the helicopter. Within minutes you have left the flies and the blown dust behind and are on your way to the nearest bush airstrip. During the time that you were treating the casualty the course director was contacting the Safari's fixed wing assets reorganising the aviation fuel trucks and liaising with sheep stations and local police. There would be a refuelled aircraft at the sheep station's landing strip waiting for the arrival of the casualty and fully prepared to evacuate the injured man to Alice Springs District General Hospital. It will have taken less than three hours from injury in the obscurity of the outback to assessment in the major health facility.

Back in the field the ambulance crew are busy eating a leisurely lunch. They have strapped wrists provided sunscreen and fly repellant and washed out much dust from motorcyclists eyes. They can now relax for 10–15 minutes and watch the cars and bikes skid by before picking up where they left off providing care for the mid-field.

By early afternoon the raid's pace is starting to tell. The competitors have been racing for some hours and are showing signs of fatigue. The blazing sun, the arid heat, the lack of sleep the tortuosity and ruggedness of the track all combine to produce a physiological assault on the body. The sweep vehicles are assisting the stragglers. Although not officially tasked to help the competitors complete the course their primary role being safety back-up to prevent people getting lost in the outback the team spirit generated by the event results in them dusting off fallen riders providing cold drinking water and even rendering occasional mechanical assistance to the tail enders. When cars become bogged down in thick mud or sink up to their axles in a sandy river bed it will quite often be the sweep vehicle's winch or tow strap that succeeds in recovering the vehicle. However as dusk falls and some of the competitors enthusiasm turns to disappointment then despair so the sweep vehicle provides solace to the race-goer. After all, there is always next year!

By late afternoon the helicopter has returned to its secondary task as an aerial video platform prior to gaining the night stopover before dark. The doctor from the helicopter after a relatively leisurely day will man the medical tent that evening and through the night. Early evening will see the ambulance arrive in camp too. Not for long though as there may well be an injury needing further assessment by the local X Ray facility some 160 km away or maybe a casualty to deliver into the hands of the Royal Flying Doctor Service for ongoing evacuation and treatment.

The early start a full day's activities and plenty of fresh air all generate a healthy appetite and so it is back to the Starlight Restaurant for dinner. Whilst the food may not be nouvelle cuisine it is hot and available in copious quantities. Over the trestle tables anecdotes are recounted in the balmy night air to the accompaniment of the cicadas.

High technology travels with us too as the media reporters are able to utilise the dish antennae of the travelling Telecom truck to beam our stories via satellite to the rest of the world. We may be 1000 km from a significant town, without running water or flushing loo but it is still possible to phone home by credit card!

General Practice hours in the medical tent finish at 2200. However although the flaps are down on the tent, the duty medical officer can expect to be disturbed at least once a night by the welder with burns the tyre repairer with a sub ungal haematoma or the mechanic with a laceration. Well past midnight the race goes on. The sweep vehicles are still in the bush tagging along after the last vehicle. The doctor in the sweep is a little agitated. Not only is his gluteal region sore from being bounced around in the back of a car for 18 hours but also the conditions are perfect for a major accident. The riders are tired the course remains treacherous it is pitch black radio communication can be difficult at night. Fortunately the pace of the Safari has slowed to a crawl so any impact would have a relatively slow velocity. But how much force is required to avulse a renal pedicle fracture a femur or dislocate a cervical vertebra? With fingers crossed he re-adjusts the pressure points on his ischial tuberosities and attempts to return to a fitful doze. Tomorrow should be a better day as the rotational duties

Fig. 1 Starlight r[illegible]

Fig. — [illegible]

will take him back to the helicopter. Unfortunately this will require another early start.

My lasting memories of my time with the Australian Safari are several-fold. Perhaps the two most clear in my mind are the magnificence of Ayers Rock and the challenge of the Daly River crossing.

Ayers Rock—In Uluru National Park at the very red centre of Australia thus symbolises Outback Australia. The tourist brochure photographs really do not do it justice. Almost surreal its colour is more vivid than the photographs no matter what the time of day. It could be considered a relatively low mound in comparison to Alpine mountains but its impressively precipitous sides suddenly shoot up from the surrounding plains. The barren rock itself is almost shiny and smooth whilst the surrounding bush is highly textured by low scrub vegetation. It is this contrast of topography which intrigues the observer. Whilst its distinctive shape can be viewed from a distance it is not until standing at its base that the true aura of the rock is appreciated. Contributing to this atmosphere is the knowledge that each year young and old would-be climbers die in their attempt to scale the rock even now that a safety chain has been sited on the steepest part of the route to the top. The Aborigine Community is less than happy with this chain considering it a desecration of their most sacred of places. However it must be said that the commercialisation of Ayers Rock is well restrained with the flow of tourists carefully marshalled so as to leave this natural monument unspoilt for future generations.

The Daly River—Crossing was performed on the last day of the Safari. As such all the competitors were exhausted by their previous efforts yet all could sense the imminent success of the finish line. The Daly River itself meanders through the Northern Territories being some 100 metres wide at the point of our crossing with lush vegetation crowding its banks. The water lazily flowed amongst island rock outcrops some 0·5–1·0 metres deep at this fording. This was in marked contrast to the arid low scrubland of the Tanami Desert crossed on the previous day. Whilst creating a significant physical water hazard there was also the additional psychological torment of the possibility of a crocodile attack. These living dinosaurs unchanged for thousands of years are making a big revival in the Northern Territories now that their hunting has been banned. With some creatures over 3·0 metres long being sighted the crocodile attacks being

Fig 3 The author at Ayers Knck

Fig 4 Crossing the Daly River

relatively frequent they pose a significant threat for the unwary If the engine stalled on the way across who was to volunteer to push the vehicle to the other side?

The ambulance in which I was travelling was one of the first vehicles across the ford With video camera running the press perched on either bank and watched us pick our way gingerly across the river We progressed, not too fast and not too slow the wheels of the vehicle skittering about on the slippery stones of the river bed We gained the opposite shore just in time Our air filter had been thoroughly dampened by splashed water and strangled the engine which spluttered and stalled as we groped our way up the slope of the far bank Rolling backwards we found a small grassy plateau on which to halt by the side of the river whilst the filter dried out We were delayed for half an hour and mercifully our services were not required during this time.

However this enforced delay did offer me the opportunity of watching the remainder of the Safari tackle this water hazard Speed was of the essence Go too fast and control would be lost the current carrying you into deeper water or water would be thrown over the engine and drown the electrical system Motorcyclists going too slowly would lose balance slip on uneven river beds and receive a free swimming lesson in the river Trying to kick start a motorcycle in 0 5 metres of flowing water is not an easy task especially when you are busy looking around for the snapping jaws of a large reptile! Slow cars risked stalled engines and with nearly all exhaust pipes being below the water s surface great difficulties were experienced in trying to restart This entailed a long push to the far bank

The scrabble up the muddy bank was also entertaining. The track became progressively more slippery as each vehicle cascaded water after successfully fording the river In almost every case the car had temporarily lost considerable power in the crossing the result being an asthmatic wheezing from a struggling engine as tyre traction proved elusive on the muddy slope This mechanical thrashing of parts continued until the track flattened and became drier but not all vehicles achieved motion in a forward direction on their first assault of the slope much to the consternation of the following drivers

Being so close to the action..you could readily observe the expressions of grim determination on the faces of the racers as they careered by Not surprisingly more than a few were grinning from ear-to ear as they thrilled to conquering this final hurdle and considered the prospect of reaching the finish line at Darwin

CONCLUSION

The Sydney to Darwin Motor Safari is one of the ultimate challenges for man and machine to test themselves against an arduous race track. It is hoped that these two articles have imparted a little of the flavour of a medical officer involved with the raid for it is an event not to be missed as either a competitor part of the official support team or even as an observer

I was privileged to be the Chief Medical Officer and to be given the opportunity to organise the medical cover for this event and also to lead the medical team as the raid progressed through the Australian Outback From being involved with pre-event committees through to attending post race washups it is possible to actively contribute to the successful running of the Safari However it is in the Outback that the event becomes most alive and enjoyable From mountains to desert temperate to tropical city to sheep station the event is one of contrasts This contrast is not confined to topography either as this international event attracts diverse peoples from around the world It is also an event able to accommodate both the private enthusiast entering the (modified) family car to the fully custom built and works supported professional driver driving a state of the art vehicle

As the raid progresses the spectacle of the bush gradually unfolds Day-by-day damage is inflicted upon the competitors and their vehicles this both emphasising the potentially hostile environment and also generating a team spirit which pulls the whole Safari into one cohesive group Taking this into account it becomes obvious that practising medicine under these conditions is far removed from everyday clinical practice The expectations which each competitor holds for the outcome of a consultation are somewhat different to those usually expressed This medical departure from the norm forces one to reconsider one s whole approach to medicine in a rapid learning process For the doctor it is perhaps this change of emphasis which provides the greatest challenge as new goals in patient management have to be adopted. The altered attitude towards the doctor–patient relationship and the difficulties of providing patient care and evacuation in a potentially hostile environment are brought into sharp focus in the Australian Outback As the event progresses the adventure develops into a training evolution with many strong parallels to be drawn between the raid and medical care at sea

POST SCRIPT

My time in Australia as an exchange officer is recalled with many strong memories Some of the most pleasant and vivid are those experienced on the Sydney to Darwin Safari

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A Review of Submarine escape trials from 1945 to 1970 with a particular emphasis on decompression sickness

K W Donald

(Originally prepared in 1970 for the Underwater Physiology Subcommittee of the Medical Research Council's Royal Naval Personnel Research Committee and reproduced here by kind permission of the MRC)

INTRODUCTORY NOTE (JUNE 1991)

This report was written at the conclusion of the series of free ascent escape trials off Malta in 1970. Successful escapes were achieved from a submarine lying on bottom at 600 fsw. The report considered for the first time the absorption and elimination of nitrogen by the body tissues during the whole escape cycle and particularly the degree of supersaturation on surfacing. An easy method of approximate estimation of the nitrogen absorbed during the escape cycle with various escape profiles was also presented.

One important finding was that the major absorption of nitrogen was during the ascent to surface. As the rate of ascent was considered to be near maximal the risk of acute decompression sickness was increasing critically in the deeper (500 to 600 fsw) escapes. The considerable degree of supersaturation of the 'fast' tissues made it highly probable that free nitrogen bubbles were present in the circulation after such escapes. In view of the narrow and somewhat unpredictable margin of safety it was suggested that deeper escapes (400 to 600 fsw) whether in chamber or in real sea-submarine trials should never be repeated by the same individual in any trial. In any case such escapes should be a once-in-a-lifetime experience.

This report had a very limited circulation and was never published. Since that time it has no doubt rested undisturbed in the depths of an appropriate file. Recent events have highlighted these problems again and the author felt it would be useful to place the relevant research and sea trials carried out by the Royal Navy between 1945 and 1970 on more permanent record. It is also hoped that it will, even after this long latent period, stimulate work on decompression sickness in such escapes using modern concepts and techniques.

With retrospective wisdom it appears to the author that trial escapes (chamber or sea) from depths greater than say 300 fsw are neither necessary or justifiable. They have already been achieved from depths of 500 to 600 fsw (sea-submarine) at considerable risk to personnel and do not need to be repeated except in real life-death situations. However not infrequent escape trials from submerged submarines are essential to ensure that any changes in design or material no matter how minute of submarine escape facilities including survival suits and hoods do not jeopardise the efficiency and safety of this useful but highly vulnerable method of escape. Such trials which also train submarine and surface crews need only be from relatively modest depths (say 200 fsw or less). Deeper trials without bodies can still be

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carried out to test the submarine's performance in relation to escapes.

Finally it is important to emphasize that all the opinions expressed by the author in this introduction and report are his and his alone and that they in no way reflect the views of the Royal Navy the Ministry of Defence or any other formal body.

Summary

All simulated and actual submarine escape trials carried out by the Royal Navy from 1945 to the present time (1970) are described and tabulated. An attempt has been made to integrate these results.

A further attempt has been made to assess more precisely the risk of decompression sickness after submarine escapes. This risk has so far been determined entirely by trial and error. The theoretical behaviour of various tissues in the body during such escapes have been calculated and correlated with past results. A simple but effective formula is proposed to allow immediate assessment of the risk of decompression sickness after a particular escape. The possible contribution of oxygen and of the overloading of the fast tissues with nitrogen to the changing nature of decompression sickness after deep escapes is discussed.

The feasibility of even deeper submarine escapes and other future developments are finally discussed.

INTRODUCTION

Now that air breathing buoyant ascent submarine escapes from 600 ft have been successfully completed in open sea trials (Upshot V) it is necessary to consider whether deeper escapes are feasible and whether greater safety can be achieved in the present range.

The author felt that it would be useful to review all simulated submarine escape trials and actual escape trials from submarines at sea carried out by the Royal Navy since the present series was initiated in 1945. The information has been gathered from various published and unpublished reports. A number of earlier workers have been kind enough to seek out and provide further details of their original protocols. It is hoped that the bringing together of this widely scattered information into one document will help present and future workers to integrate and understand the results of numerous experiments over the last 25 years.

HANDLING OF DATA

Details of all goat experiments are given in *Table 1*. Similarly all simulated (chamber) or real submarine escapes carried out by the Royal Navy personnel are given in *Table 2*. There is a very wide range of depth rate and type of compression rate of decompression and time at maximal pressure. The number of subjects in each experiment also varied greatly. The number is, naturally of great importance in interpreting the significance of any particular result.

The information is given in *Tables 1 and 2* in the following manner. Column 1 gives the depth of the escape column 2 the time at maximal pressure, column 3 the rate of compression and column 4 the rate of decompression. Columns 5 6 and 7 are concerned with an attempt to provide an easy albeit approximate estimate of the amount of excess nitrogen contained in the subjects tissues on surfacing after the escape procedure. This will be discussed at greater length later. Column 8 gives the number of subjects in each series and column 9 the number developing decompression sickness. Column 10 gives the individual details of each case of decompression sickness column 11 gives the diagnosis and column 12 the final outcome. As only two cases of decompression sickness occurred in the human exposures reported in *Table 2* columns 10 11 and 12 are combined in the single column (9) where comments are made on certain aspects of the experiments.

Assessment of Risk. Returning to the figures given in columns 5 6 and 7 in *Tables 1 and 2* it was felt that it might be useful to have an approximate estimate of the degree of risk to the subjects during these remarkably varied escape procedures. So far this has only been done by trial and error. The basis of the method used here is to merely calculate f_t. Excess pressure dt (termed SPdt from now on). This is the summation of the multiple of depth in feet (representing the increased pressure of nitrogen) × time in seconds during the whole of the exposure to increased pressure. This calculation will only give a measure of the nitrogen absorbed by the subject if the following conditions are satisfied:

1. The body is taking up nitrogen throughout the exposure to increased pressure including the whole period of decompression.
2. The rate of uptake of nitrogen remains proportional to the excess ambient pressure throughout the exposure.

These assumptions are patently not valid particularly in the early series (*Table 1*) with slow compression and decompression and 2 to 7 minutes at maximal depth. Under these conditions the rate of nitrogen uptake for a given pressure will begin to fall considerably even while at high pressure, and nitrogen will be

excreted rather than absorbed during a considerable part of the decompression In such cases SPdt will give a considerable overestimate of the extra nitrogen in the body and the risk of decompression sickness on surfacing

As the series developed the escape procedure became a very rapid bounce dive with rapid compression (20 seconds approx) and a few seconds on bottom The major exposure to increased pressure in such escapes is, in fact not present, limited to about 8 5 ft per second

It is useful to consider a particular example of this type of escape as carried out from 500 ft in the Upsbol V trials (*Figure 1*) In such a rapid escape (20 seconds compression of which 250 to 500 ft only takes 5 seconds 3 seconds maximum pressure 60 seconds decompression) the circulation time becomes an important factor If we assume that the blood takes 10 seconds to travel from the lung to the tissues there will be a similar lag between the ambient pressure and the arterio-capillary blood gas tension Thus when the ascent commences the arterio-capillary blood gas tension would be only 160 ft sea water and when the arterio capillary blood gas tension reaches 500 ft the subject would have already ascended 60 ft from the submarine When the subject surfaces the arterio-capillary blood gas tension would still be 83 ft of seawater

Although it is tolerably certain that by far the greatest volume of nitrogen will be absorbed during the decompression in such an escape no previous attempts seem to have been made to estimate the nitrogen uptake of various tissues during the escape cycle It is likely that in such a brief exposure to high pressure the very fast (1–2 min half saturation) and fast (3–7 min half saturation) tissues are those mainly involved The model selected for study was one kilogram of fluid (partition coefficient=1) tissue with varying perfusion rates. It is generally agreed that the nitrogen uptake of fast tissues is largely perfusion limited Complete equilibration of nitrogen tension throughout the kilogram of tissue and the effluent blood was also assumed If the kilogram of tissue is given a perfusion rate similar to that of the human brain (540 ml/kg/min) then the half saturation time at a constant pressure is 80 seconds (k=0 52) The uptake of nitrogen of such a tissue can be calculated during the various phases of the escape cycle and details and results of this calculation are given in *Table 3* and are illustrated in *Figure 1* It is appreciated that apart from the assumptions made these calculations are not entirely realistic but a number of very interesting points emerge

In the "very fast" model only 29% of the total nitrogen absorbed during the whole cycle is taken up during compression and at maximal pressure Seventy-one percent is absorbed during the decompression Further in this 500 ft escape nitrogen is absorbed until 4 seconds before surfacing In using SPdt as a measure of nitrogen absorbed and present in the body on surfacing it is assumed that the uptake is proportional to the ambient pressure through out One can easily calculate the nitrogen uptake of the tissue making no allowance for the increasing nitrogen tensions during the escape procedure and these figures are also given in *Table 3* The calculated true nitrogen uptake of the very fast tissue is 76% of that as measured by SPdt

This percentage will be much higher in less perfused or partially diffusion-dependent tissues For instance if we take a 'fast' tissue with 150 ml/kg/min perfusion (half saturation time 5 minutes k=0 139) the calculated true nitrogen absorption of this five minute tissue is 89% of that obtained when it is assumed that the nitrogen uptake is entirely proportional to the excess nitrogen pressure (SPdt technique) The reasons for this relatively small difference are the extreme brevity of the exposure and the very rapid fall in ambient pressure and nitrogen tensions just as the increasing tissue nitrogen tension is beginning to slow down absorption (*Figure 1*) These calculations are also given in *Table 4* It will be noted that the 'five minute' tissue is absorbing nitrogen throughout the escape from 500 ft and that the final tissue nitrogen tension is only one atmosphere (Haldane ratio 2 29). The possible role of very fast and fast tissues in decompression sickness after the escape procedure will be discussed later There is no doubt that the use of a computer (in contrast to the author's slide-rule) to calculate the behaviour of different tissues during the escape cycle would greatly add to our understanding of the hazards of submarine escape Meanwhile SPdt appears on theoretical grounds to be for the time being, a useful approximate measure of the risk of decompression sickness after the escape *Figures 3* and *4* certainly bear witness to this

Calculation of SPdt. *Figure 2* shows a simulated escape (heavy line) from a depth (D) diagrammatically Time of compression (C) on bottom (TOB) and of decompression (DC) are shown If the rate of compression and

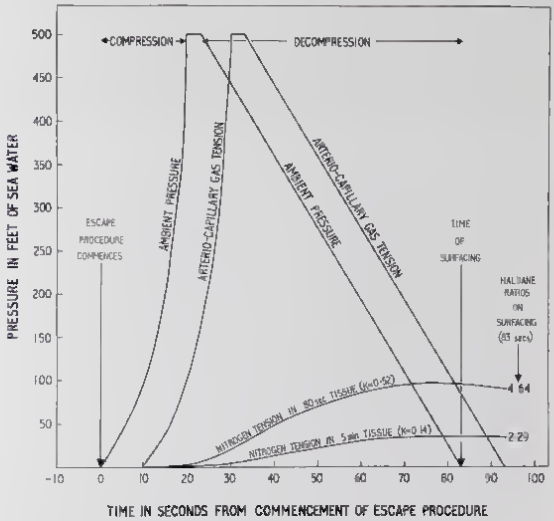

Fig 1 Time pressure relationships in a submarine escape (Upshot V type) from 500 ft. The calculated nitrogen tensions in a very fast (k = 0·52) and fast tissue (k = 0·14) are also shown.

decompression are constant although they may be different then it is obvious that (C/2 + TOB + DC/2) × max depth equals SPdt. Columns 5 and 6 in *Tables 1 and 2* show C/2 TOB and DC/2 separately and summated. SPdt is shown in column 7.

In all the early experiments a constant rate of compression was aimed at but not always achieved. In recent years in all the sea escapes there is not only a very rapid rate of compression but a doubling of pressure in constant time. This is not only favourable to ear clearing (early compression slower) but greatly reduces the time of exposure to very high pressure and the resultant absorption of nitrogen. An accurate calculation of SPdt during compression can easily be made (C/3 × depth approximately) and should be used in future calculations.

Finally all the results of the goat experiments are shown in *Figures 3* and *4*. In *Figure 3* the equivalent time at depth (C/2 + TOB + DC/2) is plotted against the maximal depth. The isopleths are the multiples of the true values and allow SPdt to be noted in relation to each series. In *Figure 4* SPdt is plotted against the escape depth. As SPdt is strongly influenced by the maximal depth there will be some inherent relationship. Nevertheless the figure demonstrates the value of SPdt despite its definable short-comings as an easily calculable measure

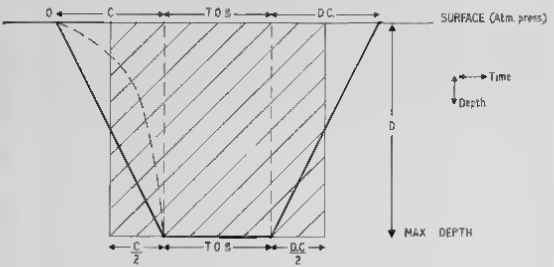

Fig 2 Diagrammatic representation of time pressure relationships during simulated or real submarine escape (heavy line) The interrupted line shows the relationship with doubling of pressure in constant time as in Upshot IV and V

of safety In 78 out of 90 exposures the number of goats employed was five to 30 Of the remaining 22 experiments with four or less goats 19 many of which were single exposures, were in the original 400–500 ft studies (*Table 1*) If even a single instance of Type II decompression sickness (DCS) occurred in a series then it is represented in *Figures 3 and 4* by a Type II DCS symbol The same holds with the series represented by the symbol for bends cured by recompression or bends recovering without recompression If no case of decompression sickness occurred in the series then an open circle is used Thus the degree of safety or danger is expressed in an all or none manner as ideally completely safe exposures are being sought *Figure 5* illustrates in the same way the human simulated or actual submarine escapes which are detailed in *Table 2*

REVIEW OF ESCAPE SERIES

Donald Davidson and Shelford 1945[1]

This work was carried out in the Admiralty Experimental Diving Unit between VE and VJ days The feasibility of this escape procedure breathing air rested on the safe immediate surfacing of goats after exposures of 15 minutes to air pressures of up to 150 ft sea water Reported instances of individual emergency free ascent escapes from over 200 ft during the Second World War also gave rise to optimism (see *Report of the Ruck Keene Committee* for details) In earlier work Kagiyama[2] had shown that air divers could surface immediately after 15 minutes at 164 ft without decompression sickness Shilling and Hawkins[4] had also shown that divers breathing air could surface safely after 37 minutes at 100 ft 18 minutes at 150 ft and 14 minutes at 185 ft

Goats were used in this study They had long been employed in the study of decompression sickness and work in many fields in the Admiralty Experimental Diving Unit during the war (mixture diving surface decompression etc) had confirmed that their comparability with man in this regard was remarkable

At this time the feasible rate of compression was considered to be 2 ft per second The time necessary at maximal depth was thought to be 2 to 3 minutes (exchange of signals manipulation of hatch possible ejection mechanisms) Observations showed that the rate of ascent without added buoyancy was also 2 ft per second.

It will be seen from *Table 1* that successful runs occurred with simulated escapes from 150 ft (3 5 and 7 minutes on bottom) 200 ft (3 and 5 minutes on bottom) and 250 ft (3 and 5 minutes on bottom)

Incurable decompression sickness occurred after 7 minutes at 250 ft (one out of four goats) 3 minutes at 300 ft (three out of five) and five minutes at 300 ft (one out of five)

A further series of simulated escapes from 300 ft were carried out with the same rate of

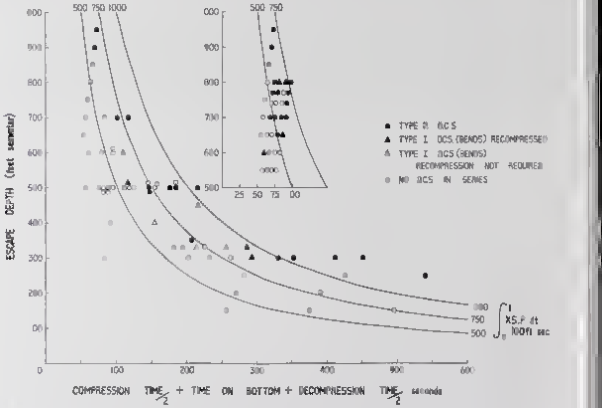

Fig. 3 The escape depth is plotted against the equivalent time at full depth. The asterisks represent the multiple of these values and equals SPdt. All goat experiments from 1945 to 1970 are illustrated. Eaton's second 1967 studies are shown in a separate panel along with the goat studies from 650 to 950 ft carried out before Upshot V.

compression and decompression but using a 34% oxygen/66% nitrogen mixture. Two escapes with 5 minutes at 300 ft and three escapes with 7 minutes at 300 ft were completed with no signs of decompression sickness.[7]

The assumption that the role of oxygen in decompression sickness could be ignored in super-oxygenated mixture diving or submarine escape, or even in submarine escape breathing air from great depths, was also questioned at this time. Experiments were carried out[5,6] which showed that very severe but transient decompression sickness could be caused by super-oxygenated air (60% oxygen).

The tolerable rate of compression and possible dangers of nitrogen narcosis were also considered. It was shown that men could be compressed without discomfort at 6 ft per second and that they were able to carry out cancellation tests during such a compression and at 300 ft with reasonable efficiency.[2]

Pratt and Taylor 1946

These trials were carried out at the Royal Naval Physiological Laboratory after discussions between the Underwater Physiology Subcommittee and Admiral Ruck Keene. Although they are reported as being from 300 ft they were actually from 330 ft. The danger zone in the previous series was avoided and no important casualties occurred. The rate of compression and decompression was 2 ft per second as in the previous series. Maximal time on bottom was 2 minutes. Three out of 14 goats developed bends (Type I DCS) in this exposure but only one required recompression.

Simulated escapes from this depth were also carried out (1 and 1·5 minutes on bottom) with a decompression rate of 4 ft per second. No important difference was noted (*Table I*).

Taylor 1947[1]

Taylor was asked by the Underwater Physio-

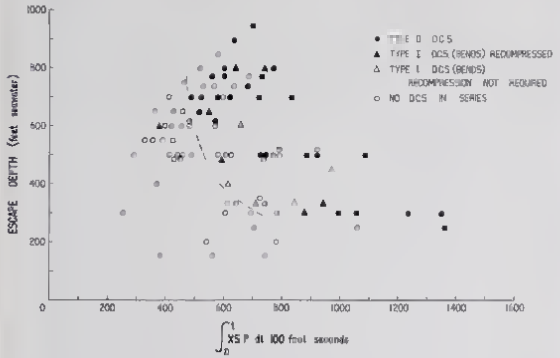

Fig 4 The escape depth is plotted against the calculated SPdt All goat experiments from 1945 to 1970 are illustrated

logy Subcommittee to carry out longer exposures (time at maximal pressure) at 300 ft The rate of ascent was again 4 ft per second His findings (*Table 1*) were very similar to those of Donald *et al*[11]

If we examine the results so far obtained as plotted in Figures 2 and 3 the incidence of decompression sickness in the 300 to 330 ft range is reasonably consistent Serious decompression sickness occurred when SPdt was over 990 hundred ft/sec (hfs) Bends requiring recompression occurred with 940 and 879 hfs and bends not requiring recompression occurred with 841 and 796 hfs

Taylor, 1947–48[9 10]

During the late 1940s Taylor[9] showed that goats could safely carry out the simulated escape procedure from 220 and 300 ft (4 ft per second decompression) while submerged underwater He further showed that unconscious anaesthetized goats could make similar simulated ascents while underwater without any untoward effects[10]

Cowan *et al*[11] and Wright[12] 1948–49

Human experiments were carried out at the Royal Naval Physiological Laboratory in relation to respiratory behaviour during the ascent Calculations suggested that there would be no important carbon dioxide accumulation in a 4 ft per second ascent from 300 ft Yet most subjects "felt a great need" to inspire during a 4 ft per second decompression from 150 200 and 250 ft Only Wright continued to exhale throughout and he blithely completed 300 ft escapes above and below water with 2 and 4 ft per second rates of ascent It is not generally realized that these were the first human simulated escapes from such depths (*Table 2 and Figure 3*) and that Wright carried out the majority of them In the 300 and 330 ft escapes SPdt figures of 399 to 549 hfs were encountered but these are well within the safety zone at these depths as judged by goat experiments No decompression sickness was encountered.

There was now considerable doubt as to whether most subjects could ascend from 300 ft without inspiring and drowning even if the rates of ascent were increased considerably

Another important contribution following the Knox-Keene Committee was the introduction of the Submarine Escape Immersion Suit (SEIS) with a buoyancy stole This with 10 lbs

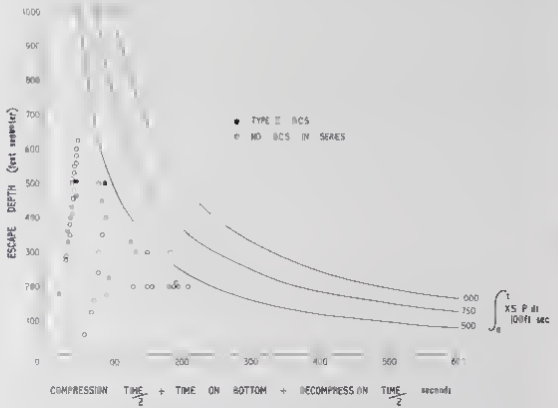

Fig. 1 Human exposures (*see Table 2*) The escape depth is plotted against the equivalent time at full depth and the isopleths represent the multiple of the values and equals SPdt

buoyancy gave a rate of ascent of 4–5 ft per second [13] It had also been agreed that the 100 ft tank should be constructed at HMS *Dolphin* for free ascent training

In 1950 the HMS *Truculent* tragedy highlighted many of the great dangers of compartmental escape even from relatively shallow depths The multiple hazards of compartmental escapes (decompression sickness, carbon monoxide poisoning oxygen poisoning compressed toxic fumes and gases) from greater depths were already well appreciated [2 7] The need for free ascent training and definite positive buoyancy during the ascent was now even more clearly recognised

Yet there was a remarkable pause during the next decade although buoyant ascent training began in 1953 Methods of absorbing carbon dioxide from the escape department during flooding (spray flooding refrigeration) were explored but without success. The use of oxygen nitrogen mixtures both in the built in breathing system (BIBS) and in the submarine escape breathing apparatus was investigated and a 40% oxygen 60% nitrogen mixture was recommended by the Subcommittee and adopted However the use of these mixtures was discontinued after a few years owing to difficulties in supply and proper maintenance, out weighing possible gains in safe escape depth The United States Naval Research Laboratory carried out work on increasing speeds of compression of human subjects and performed simulated escapes on air down to 450 ft (no details available) Successful escapes[14] were accomplished by two subjects in open water from 302 ft (keel depth 322 ft) Compression time was 25 seconds time at maximal depth 7 seconds and rate of ascent 5 7 ft per second (53 seconds ascent) Assuming human compression SPdt was 139 hfs, again a very safe exposure at this depth It was not until 1962 that the Underwater Physiology Subcommittee strongly recommended that escapes should be carried out by the Royal Navy from submarines in open water Rapid compression which was now feasible was also

recommended even at the possible risk of rupture of the ear drums. At the same meeting another important development occurred. Trials of the Siebe Gorman hood were reported but with only moderate enthusiasm [15]

Upshot I Trials (*HMS Tiptoe*) 1962[16]

These trials were carried out successfully in open water in August and September (*Table 3*). They were preceded by preliminary trials in HMS *Tireless* where the subjects were decompressed in the escape tower. High pressure air was used for compression a geometric rate of compression being aimed at.

The deepest escapes from HMS *Tiptoe* were from 240 ft (keel depth 260 ft). Compression time was 30 seconds (pressure doubled in constant time) time at maximal pressure was 27 to 49 seconds and the rate of ascent 5·5 ft per second with siole only and 6·5 ft per second with siole and hood. The maximal individual exposure was 30 seconds compression 49 seconds on bottom and 38 seconds ascent. SPdt was 199 hfs again a very safe exposure. The subjects without a hood felt no desire to breath in during the ascent and no great preference was expressed for hood ascents [16]. In April 1963 the Submarine Escape Working Party of the Underwater Physiology Subcommittee was set up. Its remit was to make recommendations concerning open sea escape trials from 450 ft and then perhaps from 600 ft. It was emphasised that the escape tower needed streamlining. Even high rates of compression with doubling of pressure in constant time were desirable and feasible. It was also considered necessary to improve the hood and its air supply during this very rapid compression. There was general agreement that time at maximal pressure should be only a few seconds.

Permission had been given by Flag Officer Submarines for human trials to determine feasible rates of compression, and the speed of onset and effects of nitrogen narcosis. These trials were to be followed by simulated escapes as recommended by the Subcommittee. The Royal Naval Physiological Laboratory had already achieved compression to 360 ft in 18 seconds without untoward symptoms.

A series of simulated escapes using goats was also recommended. The results obtained were reported in UPS 232[17] and UPS 241 [18]. The results given in *Table 1* are those from the full report by Barnard and Eaton [18]. This work was complete before the Upshot IV Trials (July 1965).

A useful and successful trial was carried out in Loch Fyne (HMS *Orpheus*) in October 1964 from a keel depth of 200 ft using the single escape tower the new hood and inflation system and the Mark VI Submarine Escape Immersion Suit. The rate of ascent was found to be 8 ft per second.

Bernard and Eaton 1963–65 [8]

A series of simulated escapes were carried out with goats from 300 to 500 ft. Compression time was 30 seconds and the rate of ascent 4 to 5 ft per second. Time on bottom varied from 1·5 to 2·5 minutes. Five and ten minute decompression stops at 10 ft were used as well as direct ascents. It is not possible to judge the protection afforded by the 10 ft decompression stop procedure as against direct surfacing in this series as only one definite instance of severe decompression sickness occurred in 40 escapes. Only the direct ascents from 400, 450 and 500 ft are shown in *Table 1* (Series I). In their second series (same time of compression and rate of decompression) all goats surfaced immediately. The 300 and 400 ft escapes were uneventful the time on bottom being about 30 seconds. In the 500 ft escapes single studies were mainly carried out with increasing time on bottom. Two incurable Type II cases of decompression sickness occurred (*Table 1 and Figures 2 and 3*) after exposures at maximal depth of 71 and 112 seconds. SPdt in these two instances was 740 and 920 hfs respectively. The human exposures were from 300 to 500 ft (*Table 3*). The rate of decompression was 5 to 6 ft per second. Time on bottom up to 400 ft was 40 seconds. Time of compression (linear time) was 20 seconds. If it was more prolonged, the time on bottom was reduced by that amount. Barnard and Eaton first used 10 ft stops particularly after escapes from the greater depths, and reduced the stop from 5 minutes to 1 minute before carrying out a direct escape experiment. Seventeen successful direct ascent escapes were carried out from 350 ft and 10 from 400 ft (maximal SPdt 360 hfs). At 450 ft, 19 successful escapes were completed with 20 seconds compression and 30 seconds on bottom. SPdt was 382 hfs. In the 500 ft escapes five exposures were carried out with 20 seconds on bottom and three with 30 seconds approximately on bottom. The latter exposure is probably the most dangerous escape carried out by human subjects. SPdt being 442 hfs. One of the subjects developed Type II DCS (malaise paraesthesia right arm slurred speech ataxia) which was

rapidly cured by therapeutic recompression with air to 165 ft.

Upshot IV (*HMS Orpheus*) July 1965 [4,20]

This trial was carried out in the open sea in July 1965. Maximal keel depth was 500 ft (escape depth 475 ft). The escapes which were without untoward events are detailed in *Table 2*. Compression (pressure doubled in constant time) was achieved in 25 seconds, time on bottom was 4 seconds, rate of ascent 8 ft per second. Maximal SPdt was 207 h/s, an extremely safe figure at this depth as judged by previous human and goat experiments (*Figs 2, 3 and 4*). Upshot IV emphasized the remarkable success and potential of this method of escape. No important narcosis was felt by the subjects, thus confirming the findings of Bennett *et al* [21]. The hood inflation system through the buoyancy stole worked extremely well. It was considered that no special ability or lengthy training was required by the escapers. After Upshot IV there was considerable debate in the Subcommittee and elsewhere as to whether experiments at greater depths were needed or justifiable. Nevertheless the Subcommittee decided to recommend that relevant research should continue so that animal data would be ready if a 600 ft open sea escape was later proposed by the Executive.

Eaton 1967 (i)[2]

The next series reported by Eaton from the Royal Naval Physiological Laboratory was a very important one. Escapes from 500 to 700 ft were carried out, the time of compression (linear) being 30 seconds throughout. Two widely different rates of compression were employed: 6 ft per second and 15 to 20 ft per second.

In the 500 ft series escapes with 30 and 60 seconds on bottom caused no decompression sickness at either rate of ascent. With 90 seconds at maximal depth there was a suggestive difference in favour of the more rapid ascent (*Table 1*). Unfortunately both at 500 and 600 ft, as casualties began to appear with longer time on bottom, only the more rapid ascent was used. However there is one striking pair of series at 700 ft. With 45 seconds on bottom and a rate of ascent of 6 ft per second, three incurable cases of Type II decompression sickness occurred in six escapes. With the same rate of compression and time on bottom and 15 ft per second rate of ascent there were no casualties in eight escapes. The behaviour of very fast (80 seconds) and fast (five minute) tissues have been calculated during these two escapes and are illustrated in *Figure 6*. It will be seen that the very rapid tissues achieved the same partial pressure of nitrogen (238 fsw) on surfacing in the slow and fast ascent escapes. The fact that there were no casualties in the fast ascent series suggests that very fast tissues can tolerate a Haldane ratio of over 10 without causing manifest decompression sickness. The difference in the surfacing fast tissue nitrogen tension with the two rates of ascent is not dramatic (123 and 94 fsw) but may well be critical. If one calculates the highest partial pressure in varying tissues in Albano's study[22] of maximal time at depth with immediate surfacing, making due allowance for changes during the 20 metre/min ascent, then the following figures are obtained.

Very fast tissues (80 sec)
108 ft nitrogen
Haldane ratio 5·15

Fast tissues (5 min)
105 ft nitrogen
Haldane ratio 5·02

Ten minute tissue
86 ft nitrogen
Haldane ratio 4·28

Albano's findings are very similar to those of Hawkins *et al*[4] and Eaton *et al*[25]. In these escapes the ten minute tissue nitrogen tension is far below these levels but the five minute tissue nitrogen is above it in the escape with casualties (123 ft, ratio 5·7). It should also be pointed out that the distribution of nitrogen is very different after a plain dive at a constant depth and after a submarine escape especially with a very short time on bottom. In the latter the very fast (1–2 minutes) and fast (4–6 minutes) tissue nitrogen tensions are far higher proportionately than in the slower tissues. Indeed with this 'bounce' procedure this is not surprising.

Eaton 1967 (ii)[26]

Eaton completed another very large series of goat experiments later in the same year. This excellent study, which is reported in commendable detail is again critically important. The time of compression was uniformly 30 seconds, time on bottom was 10 or 15 seconds and the rate of ascent was 6 ft or 8 ft per second. Escapes were carried out from 550 ft working up to 800 ft (*Table 1*). Eaton commenced with

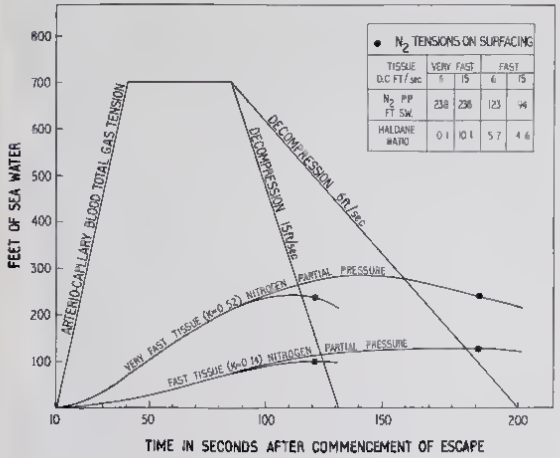

Fig 6. Time pressure relationships in a 700 ft escape (Eaton 1967 (i)) with widely differing rates of ascent The calculated nitrogen tensions in very fast ($k=0·52$) and fast ($k=0·14$) tissues are shown for both escapes Only blood gas tensions are shown—the ambient pressure changes are about 10 seconds earlier

30 goats in each simulated escape but casualties halved the number of the groups tested at the greatest pressures

The pressure exposure is far more severe than would obtain in a submarine escape as the compression was linear and the time at maximal pressure was three to five times that used in Upshot IV The results are given in detail in *Table I* and are illustrated in a separate section of *Figure 3* to aid clarity

A number of interesting findings emerged

1 In all previous simulated escapes using goats Type II decompression sickness had been incurable or fatal despite careful therapeutic recompression with air In this particular series there were 15 definite cases with paralysis, of which 12 recovered 11 with recompression to 60 ft on oxygen and one without recompression Eaton remarks On recompression with oxygen the results are dramatic and the goat has usually recovered by 60 ft In two instances (Cases 1 and 5) the signs were so transient that the diagnosis of decompression sickness was not sustained

There could be two possible explanations of these findings Firstly that the new therapeutic procedure advocated by Goodman and Workman[27] was far more efficacious than the previous procedure In view of the very poor results with classical air therapeutic recompression in Eaton previous 1967 series (*Table I*) at not dissimilar depths there can be little doubt that this procedure was a considerable advance at least in this type of decompression sickness The size of the

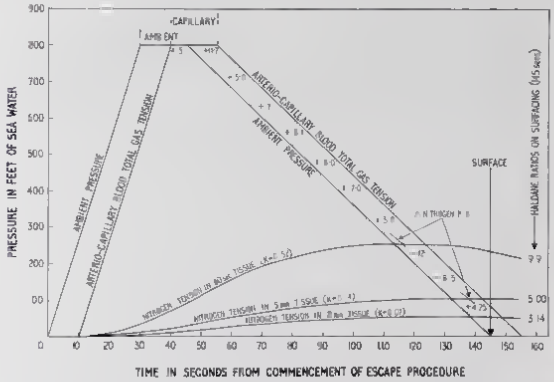

Fig 7 Time pressure relationships in an 800 ft escape (Eaton 1967 [11]) The calculated nitrogen tensions in 80 second 5 minute and 10 minute tissues are shown The figures along the arterio-capillary blood gas tension line show the excess of dissolved oxygen (in ml) over oxygen consumed in one kg of 40 second tissue with an oxygen uptake of 33 ml/kg/min

bubbles was reduced to one-third and there was no added nitrogen supersaturation in the presence of bubbles in the body As this treatment is now used providing there is rapid relief to treat decompression sickness in human subjects after escapes, it would be of great interest to determine whether the oxygen is really critically important and whether the method is still effective when slower tissues are involved

2 Even allowing the improvement of the therapeutic procedure the very rapid recovery of most of the cases immediately after or during recompression to only 60 ft and the spontaneous recoveries without recompressions suggest that paradoxically the disease is less severe at these depths and that we are encountering a new type of decompression sickness

The author suggested many years ago[4] that mixed oxygen nitrogen bends may occur in this type of submarine escape from greater depths while breathing oxy nitrogen mixtures or even air This is an attractive hypothesis in relation to some of these findings as it would explain the transient nature of the Type II decompression sickness in some instances and the rapid response to mild recompression in others This has been demonstrated in decompression sickness caused by super oxygenated air [5 6]

Yet if we again apply the tissue model to an actual 800 ft simulated escape in this series (30 seconds compression 15 seconds on bottom 6 ft per second ascent) and assume that the oxygen uptake like the rate of perfusion is similar to that of the human brain (33 ml/kg/min) we find that the excess of dissolved oxygen perfusing into the tissue over the oxygen used is very small The calculated net figures of excess dissolved oxygen (ml per kg) are given in *Figure 7* against the blood gas tension plot It will be seen that the highest figure is 18 1 ml/kg of tissue (0 77 atm) and that the oxygen uptake

exceeds the intake at 420 feet. As the goat ascends further the amount of excess oxygen becomes trivial and finally negative'. The same calculations were carried out for a 1000 ft escape with 15 seconds on bottom (30 seconds compression, 15 seconds on bottom, ascent 8 ft per second) and the highest excess tissue oxygen tension was only 1·0 atm at 560 ft. After this uptake exceeded the intake and the excess oxygen fell to zero in the last few feet of the ascent.

It can be said that the tissue studied has a very high oxygen uptake but in general the rate of blood perfusion of a tissue is proportional to the degree of metabolic activity. Nevertheless it is possible that some tissues have higher perfusion/metabolism ratios and may have significantly raised oxygen tensions on surfacing in these conditions. For instance the kidney has a rate of blood flow which is disproportionate to its oxygen demands and this may be a source of danger. More research is needed before a more definite opinion concerning the role of oxygen can be given.

There is another possible explanation of the changing characteristics of the decompression sickness as time on bottom becomes briefer and the escapes deeper. We may be dealing with a decompression sickness that only involves the fast (4–6 min) tissues. When discussing the first escape series the author attributed their success to the old adage 'Easy come, easy go'. But there must finally be a limit to the 'go' particularly if there is a phase discontinuity of nitrogen. *Figure 7* illustrates one of the escapes from Eaton's 1967 (ii) series from 800 ft where decompression sickness (bends) occurred in one out of 13 goats. The nitrogen tension in the very fast tissues on surfacing was 230 ft (Haldane ratio 9·9). Evidence has already been given that these very high nitrogen tensions on surfacing are tolerable in the very fast (1–2 min) tissues. Again we find the 'five minute' tissue nitrogen tension on surfacing just at the critical level (104 ft, Haldane ratio 5·00). The nitrogen tension in the 'ten minute' tissue on surfacing is 56 ft (Haldane ratio 3·14) and this is generally considered to be below the tolerable level. In Eaton's 1967 (ii) study there is a paired escape from 800 ft with similar times of compression and on bottom but with a 6 ft per second ascent as opposed to the 8 ft ascent in the escape just discussed (*Table 1*). The casualties in this escape were far more severe. If the behaviour of the tissues is calculated during this escape the very fast tissue tension on surfacing is the same as in the 6 ft ascent escape but the 'five minute' tissue nitrogen tension on surfacing is significantly higher (114 ft, Haldane ratio 5·35). This again suggests that the 'five minute' tissues are the most critical in this type of escape. The transient or easily curable nature of the decompression sickness may be partly due to the small amount of nitrogen involved (*Table 4*).

3. Finally, if this series of escapes is studied in *Figure 3* it will be seen that they move across the time pressure dosage isopleths (SPdt) of 500 and 750 hfs. It can also be seen that in these depths the critical SPdt is 500 hfs. The one exception to this in the 312 exposures with an SPdt below 500 hfs was not classified as a bend by Eaton as recovery was so rapid.

Upshot V (*HMS Osiris*) July 1970[29]

In June 1969 Flag Officer Submarines approached the Royal Naval Personnel Research Committee on the feasibility of deeper escape trials in the open sea from depths up to 600 ft. The Underwater Physiology Subcommittee considered this to be entirely feasible but proposed that the following experiments should be done before embarking on such escapes:

1. No animal experiments had been carried out with minimal time on bottom in this range. It was therefore proposed that the range of safety of such escapes should be tested to the limit in the following exposures:

From 650, 700, 750, 800, 850, 900 and 950 ft using 12 goats at each depth with 25 seconds compression, 3 to 5 seconds at maximal pressure and an ascent rate of 8·5 ft per second. Compression was linear with respect to time as the pressure profile of sea escapes could not yet be reproduced in chambers. These were duly carried out and no untoward signs occurred up to 800 ft. After the 850 ft exposure all goats looked very unwell but developed no specific signs and survived unharmed. After the 900 ft exposure all animals appeared unwell and two developed Type II decompression sickness which remitted without recompression. In the final 950 ft escape ten goats appeared unwell but recovered and two developed

severe Type II decompression sickness which necessitated their dispatch (*Table 1*)

2 After this series of successful escapes from up to 600 ft the Underwater Physiology Subcommittee recommended human chamber escape trials as follows

Escapes from 500 550 600 and 625 ft with 20 seconds compression 3 seconds at maximal pressure and a rate of ascent of 8 5 ft per second

These were successfully accomplished without any untoward events (*Table 3 and Figure 4*) The maximal risk escapes from 625 ft had a calculated SPdt of 312 hfs

The sea trials were carried out successfully in July 1970 the deepest escapes being from 580 ft (keel depth 600 ft) One important incident occurred The trials officer suffered impairment of vision and balance after an ascent from 505 ft He made a rapid and complete recovery with recompression to 60 ft on oxygen SPdt was 237 hfs and judging by other human and goat exposures this would have been expected to be an extremely safe escape A detailed medical report is still awaited

DECOMPRESSION SICKNESS IN HUMAN SUBJECTS AFTER ESCAPES

It is worth briefly considering the present position with regard to post escape decompression sickness in human subjects

Although goats differ from men in their handling of nitrogen after prolonged exposures, there has been a remarkable similarity between men and goats after relatively short exposures[15] and until recently it was reasonably assumed that the same applied to these escape procedures Nevertheless a considerable margin of safety was allowed when moving from goat to human exposures

Only two subjects have suffered decompression sickness after chamber or sea escapes The first has already been mentioned (Barnard and Eaton 1963–65) This subject who was the oldest member of the group and supervising officer suffered a Type II bend after a chamber escape from 500 ft The exposure was fairly severe (442 hfs) This officer had carried out four chamber escapes from 450 or 500 ft (SPdt 380–400 hfs) over a period of four weeks prior to the episode After the event he carried out an escape from 450 ft (SPdt 340 hfs) one week later an escape from 450 ft (SPdt 280 hfs) three months later and another escape from 450 ft (SPdt 230 hfs) three weeks later In this last escape he again developed Type II decompression sickness with 'heaviness' and paraesthesia affecting the left arm buttock and thigh His previous attack had been on the right side Symptoms and signs (loss of knee bicipital reflexes) did not clear until he was recompressed to 165 ft on air He made a complete recovery

The recent incident in Upshot V has some important similarities It occurred at a level of exposure where bends were not expected The subject was again the supervising officer who had been exposed to high pressures a great deal Further he had carried out a considerable number of sea escapes in the previous few days He was the oldest member of the group He stated that he had suffered a not dissimilar attack (visual scotoma) while boxing some years before He was a migrainous subject

Thus both men had carried out a number of escapes before the event and both were the oldest subjects As Todd[25] aptly remarks repetitive escaping is an unexplored subject As we would expect officers have certainly insisted on doing more than the average stint in escape trials It is highly probable that bubbles are liberated in all these deep escapes and in our present state of knowledge it might be wise to limit the total number of deep escapes by one subject during the whole of his service career The question of age may also be important as these officers with due respect had passed their physiological prime

If there are to be further deep escape trials then these matters will certainly need resolution

Finally migraine in a subject although it may well have been irrelevant in the Upshot V incident is not without danger in extreme hyperbaric work. Stress precipitates migraine and if the subject is under pressure during the period of local cerebral vasodilation then there would be a real risk of abnormal quantities of nitrogen and even oxygen being absorbed by the part of the brain involved. It appears that we have stumbled over yet another contra indication to high pressure work

Eaton and Hempleman 1971[16]

Since the submission of the first draft of this memorandum to the Subcommittee, the above workers have issued a preliminary report on the use of decompression stops after simulated escapes by goats from very great depths (up to 1200 ft)

Three-minute stops at 30 ft allow safe

escapes to be made from 900 and 950 ft (30 seconds linear compression 5 seconds on bottom ascent at 8 5 ft per second) With 4-minute stops at 40 ft escapes can be made from 1100 ft without casualties K E Taylor (Director General Ships) has intimated that escape suits capable of withstanding positive pressures up to 50 ft may well be feasible

These workers subscribe strongly to the author's proposition that oxygen may be playing an important role in the decompression sickness encountered after very deep escapes

If one calculates the orders of nitrogen tension after a 1000 ft escape they are as follows

Very fast tissues (1 3 min)
264 ft
Haldane ratio 11 1

Fast tissues (5 min)
124 ft
Haldane ratio 5 75

Ten minute tissue
58 ft
Haldane ratio 3 6

Twenty-minute tissue
16 ft.
Haldane ratio 1 6

This, as already emphasized is an entirely different pattern to that encountered after exposures to relatively constant increased air pressure It is unlikely that the 10 and 20 minute tissues are involved in the decompression sickness in this situation as they are well below the accepted critical levels The very fast tissues although they have these remarkable nitrogen tensions do not appear to be critical as calculations show they would drop dramatically to 104 ft (ratio 5 0) after 3 minutes at 30 ft Yet with this stop after a 1000 ft escape 20% of goats developed bends

The 5 minute tissue nitrogen tension would drop to 85 ft (ratio 4 25) after a 4 minute stop at 40 ft and to 90 ft (ratio 4 45) after a 3 minute stop at 30 ft These figures are not conclusive but considering the many assumptions made in these calculations the possible reinforcement by oxygen and the added effect of possible phase separation of gas they are highly suggestive that the critical tissues are in the 5 minute zone

CONCLUSION

The whole purpose of this work over the last 26 years has been to make submarine escape possible from considerable depths

The achievement has been remarkable Escapes have been successfully carried out from a submarine depth of 600 ft We can state with reasonable confidence that safe escapes can be achieved from 750 ft There would be a majority of survivors from 900 and 950 ft but there would certainly be casualties who would require urgent recompression The problem of escapes from anywhere on the continental shelf has therefore been solved The demands on the escaper are not great although no one would pretend that escaping from a submarine by any method particularly after an accident or hostile action is anything but unpleasant Nevertheless all the escaper has to do is to connect his hood inflation system and see that it remains connected during the compression The rapidity of the procedure is such that the time from commencing compression to surfacing in a 600 ft escape is 95 seconds the escaper being briefly passed through a pressure of over 19 atmospheres absolute and back to one atmosphere

The two cases of decompression sickness in the human escape trials must not be forgotten We must accept that they may occur sporadically in fit men after deep escapes that are generally considered to be safe Age is almost certainly an important factor It is possible that even these very occasional casualties will disappear if repeated deep escapes by the same individual are avoided in future

Recompression must, where possible be always available The method of recompression introduced by Eaton for post escape decompression sickness is certainly an important advance.

With the modern escape pressure profile (rapid geometric compression minimal time on bottom ascent at 8 5 ft per second) SPdt is perhaps more by good luck than good judgement, an excellent method of assessing the degree of safety It can be calculated for any escape without even a paper and pencil in a few seconds and gives a good measure of the 4–6 minute (and longer) tissue nitrogen tensions on surfacing

Throughout this work it has been deliberate policy of the Underwater Physiology Subcommittee to exploit the most simple method (air breathing immediate surfacing) to its absolute limit before considering more complex alternatives This limit has now been reached Compression is now so rapid that ear drums have been ruptured on a number of occasions The episodes are apparently painless and the drum heals quickly Perhaps compression can be further shortened but the advantage will be very

slight except at enormous depths say over 1500 ft, where it would probably be essential Time on bottom is already minimal The rate of ascent cannot be further increased without propulsion This is not feasible at present and very rapid ascent may introduce new hazards In the not unlikely event of small propulsion units becoming available they will certainly be of great use particularly in very very deep escapes (below 1500 ft) as an escaper could accelerate during early ascent and decelerate as he approaches the surface Automatic drogues have already been suggested for this purpose [29] These possible developments reminiscent of astronauts emphasize the great simplicity of the present method

Super oxygenated air which allowed much longer exposures at 300 ft appeared at one time to have great promise However with the modern type of escape air is safe up to about 700 ft and at greater depths oxygen rich mixtures would certainly cause mixed oxygen/nitrogen bends

The use of decompression stops by developing a suit to retain up to 1 5 atmosphere internal pressure for several minutes will certainly increase the depths from which safe escapes can be made Incidentally the rate of fall of tissue nitrogen in the subject is greater at say a 30 ft stop than at a 40 ft stop and the use of the more shallow stops should be fully explored

Another problem which needs clarification is the rise of pressure in the submarine before and during the escapes It is obviously most important to keep the initial nitrogen in the escaper s body to a minimum There is still the ever present risk of aero-embolism whether a man is escaping from 30 or 1000 ft It is fortunately very rare and occurs most frequently in training where large groups of men are first exposed to these conditions Scrupulous observation and immediate recompression usually prevent serious consequences More knowledge is needed of the minor abnormalities of the lung which occasion this highly dangerous series of events particularly with a view to their detection during routine medical examinations

Finally although this review is almost exclusively concerned with decompression sickness after submarine escape the author and his colleagues are well aware that without the ingenuity and skills of many experts in all aspects of naval science and the energy and enthusiasm of the executive officers responsible for the escape trials the present method of submarine escape would have remained a laboratory dream

ACKNOWLEDGEMENTS

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Notes The UPS prefix indicates papers or reports prepared for the Underwater Physiology Subcommittee of the Medical Research Council's Royal Naval Personnel Research Committee. Reports referenced are not necessarily available to members of the public or to commercial organisations

Annex

Calculation of tissue nitrogen tension during escape cycle and on surfacing. Only two tables (*3 and 4*) are given to illustrate the method used. These show the calculated uptake of nitrogen of an 80 second tissue and of a 5 minute tissue during an escape from 500 ft (compress on 20 seconds (geometric), time on bottom 3 seconds, ascent at 3 ft per second). Note that in these tables the gas tensions in the arterio-capillary blood is being specified and therefore the times of the compression bottom and decompression phases are all delayed 10 seconds to allow for the lung-tissue circulation time (see *Figure 1*). The time of surfacing is the time swimming time as interest lies in the nitrogen tissue tension at this moment.

Throughout this paper the model studied is one kilogram of fluid tissue (partition coefficient unity). It is also assumed that the absorption of nitrogen is entirely perfusion limited and that there is complete equilibrium of nitrogen tension throughout the kilogram of tissue and the effluent blood. This is generally considered permissible with very fast fast and relatively fast tissues (1.3 to 10 minutes half saturation time).

The total excess of nitrogen carried in the incoming blood at tensions above the tissue tension is calculated for each specified period in ml. It is then partitioned between tissue and blood. The resultant tissue uptake of nitrogen which is cumulative is then converted to tissue nitrogen tension stated first in atmospheres (solubility of nitrogen employed is 12.2 ml/0.760 mm Hg nitrogen tension) and then in feet of sea water. Thus the tissue nitrogen tension can be used to regard the exercise during the next period.

When the blood tissue nitrogen gradient is reversed the total excess nitrogen in the kilogram of tissue is calculated and this is partitioned between the tissue and the blood. The partition factor to determine the loss of nitrogen to blood from the tissue is one minus the usual factor (*Table 3*). The model studied in *Table 3* has a perfusion rate of 540 ml/kg/min which is similar to that of the human brain. Half saturation time at constant increased pressure is 80 seconds ($k = 0.52$). The calculated results are plotted in *Figure 1*. More detailed calculations show that the blood tissue nitrogen gradient becomes zero four seconds before surfacing and that the nitrogen lost during this period is almost negligible (0.2 ml).

In the lower half of *Table 3* the tissue nitrogen uptake is calculated as if it remains entirely proportional to the tension of nitrogen in the incoming blood and the rise of nitrogen tension in the tissue is ignored. This assumption is made when SPdt is used as a measure of nitrogen uptake during the escape. The uptake of nitrogen allowing for the rise of tissue nitrogen tension is 76% of that when the simple SPdt procedure is adopted. In *Table 4* a similar exercise is carried out with a model where the perfusion rate is 125 ml/kg/min. At a constant increased pressure the time of half saturation is 5 minutes ($k = 0.139$).

The notable findings are that nitrogen is taken up by the tissue throughout the escape procedure. The total uptake is just over one third of the uptake by the 80 second tissue. The difference between the nitrogen uptake allowing for increasing tissue nitrogen tensions and the uptake when this factor is ignored (SPdt calculation) is remarkably small. The SPdt figure is 93% of the former figure. As it appears probable (see main text) that the 5 minute tissues are particularly important in the genesis of decompression sickness in air escapes this may account for the surprisingly good correlation between SPdt and the occurrence of decompression sickness especially in the rapid bounce escapes at greater depths (*Figures 2 and 3*).

It should be emphasized that in reality the concept of 5 minute or 80 second tissues does not necessarily apply to a particular continuous tissue. The perfusion rates of any specific tissue or organ vary greatly in different parts of that organ and small areas of tissue with particular time constants may be scattered through many parts of the body. This would account for the great variety of signs or symptoms even when fast tissues are mainly involved although the central and perhaps peripheral nervous system appears more vulnerable in this regard.

Table II Decompression sickness in submarine escapes from depth: a review (1945–1970)

(1)	(2)	(3)	(4)	(5)			(8)	(7)	(8)	(9)	(10)		(11)	(12)
DEPTH (fsw)	TIME ON BOTTOM (secs)	RATE OF COMP (ft/sec)	RATE OF DECOMP (ft/sec)	TIME OF ASC 1 (sec)	TIME OF ASC 2 (sec)	DEC 2	EQUIVALENT TIME ON BOTTOM (Total of (5)) (sec)	TIME PRESS INDEX (Depth x (8)x(11)) (100 ft/sec	NO OF EXITS	NO WITH DCS	(10) DETAILS		DIAGNOSIS	RESULT
							DONALD DAVIDSON and SHECKMAN (1945)							
150	180	2	2	38	188	57	255	382	5	0				
	300	2	2	38	368	57	575	581	5	0				
	420	2	2	38	428	37	495	748	3	0				
200	180	2	2	45	180	45	270	540	5	0				
	300	2	2	45	300	45	390	780	8	0				
250	135 175	2	2	63	157	82	282	705	8	0				
	300	2	2	63	300	62	425	1062	5	0				
	420	2	2	83	420	92	545	1362	4	1	Case 1 Bend one leg Therapeutic RC Flaccid paralysis hind legs after RC Killed		B M	KILLED
300	180	2	2	75	180	75	330	990	5	5	Case 2 Chokes Bends two legs Immediately fatal		Ch	DIED
											Case 3 Chokes ?Multiple bends ?Paralysis RC inevitable Killed		Ch B	KILLED
											Case 4 Flaccid paralysis hind legs Died during RC		M	DIED
	300	2	2	75	300	75	450	1350	5	2	Case 5 Bend one leg Therapeutic RC Cured		B	CR
											Case 6 Flaccid paralysis hind legs. Therapeutic RC ineffective Killed		M	KILLED

Table 1 (Continued)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
					PRAIT and TAYLOR (19461						
330 (Reported 300)	30	2	2	83 30 85	195	643	4	0			
	60	2	2	83 60 82	225	742	14	0			
	90	2	2	83 90 82	255	841	14	2	Two cases (1 and 21 of mild bends not requiring RC	B B	CR CR
	120	2	2	83 120 83	285	940	14	3	Two cases (3 and 4) of mild bends not requiring RC	B B	CR CR
									Case 5 Bend requiring RC Cured	B	CR
	60	2	4	83 60 41	184	810	12	0			
	90	2	4	83 90 41	214	706	12	2	Two cases 16 and 71 of very mild bends not requiring RC	B B	CR CR
					TAYLOR (19471						
300	90	2	4	75 90 37	202	606	5	0			
	120	2	4	75 120 37	232	696	5	0			
	150	2	4	75 150 37	262	786	5	0			
	180	2	4	75 180 37	292	876	5	2	Case 1 Bend after 6 mins RC Cured	B	CR
									Case 2 Mild bend after 13 mins RC Cured	B	CR
	240	2	4	75 240 37	352	1056	7	6	Case 3 Bend RC Cured	B	CR
									Case 4 Flaccid paralysis Killed	M	KILLED
									Case 5 Mild bend RC Cured	B	CR
									Case 6 Mild bend RC Cured	B	CR
									Case 7 Very mild bend Not RC Recovered	B	CR
									Case 8 Very mild bend Not RC Recovered	B	CR
	300	2	4	75 300 37	412	1236	1	1 11	Case 9 Flaccid paralysis. RC failed Ill Lee	M	KILLED

Table 1 (Continued)

(1)	(2)	(3)	4	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
					SARNARD and EATON (1965) SERIES I						
350	154 157	14	4 5	15 5 86 59	566 5	723	4	0			
400	84 95	14	4	16 88 50	154	616	4	1	Case 1 Mild bend in both forelegs Not RC Recovered in 10 minutes	R	BR
450	150 155	10	4 5	14 152 50	516	972	4	1	Case 5 Rolling of head Slight leg bend Not RC Recovered	B	CR
500	155 156	5R	5	13 154 50	517	1085	5	1	Case 3 Bends two legs BC Air 187 ft Collapsed during BC BC Air 90 ft Paralysed all four legs Killed	B	CR
					SARNARD and EATON (1965) SERIES II						
300	55 33	15	4 5	13 34 57	84	255	4	0			
400	28 33	15 5	4 5	15 31 48	92	368	4	0			
500	0	10	5	56 0 54	58	460	1	0			
	10	12	5	51 10 51	90	450	1	0			
	50	15 5	5 5	50 50 45	85	455	1	0			
	20	15 5	5	16 50 53	97	485	1	0			
	45	11	5	55 45 53	120	600	1	0			
	55	14 5	5	17 55 53	125	625	5	0			
	71	10	5	25 71 55	148	740	1	1	Case 1 Paralysis commencing in forelegs RC 165 ft Air Recovered after 30 mins Paralysis returned during BC Killed	R	KILLED
	85	14 5	5	17 85 55	155	775	1	0			
	88	10	5	10 88 33	157	785	1	0			
	95	5R	5	15 95 50	158	790	1	0			

Table 1 (Continued)

(1)	(2)	(3)	(4)	(5)	(5)	(7)	(8)	(9)	(10)	(11)	(12)
					BARNARD and EATON (1965) SERIES II (Cont)						
508	113	13 5	5	19 113 52	184	920	1	1	Case 2 Shivering hind legs Recovered then rotation of head and bend one leg RC 100 ft Air Acapiace relief developed paralysis hind legs during RC after two hours RC Killed	M H	KILLED
	118	16	5	16 118 58	184	920	1	0			
					EATON (1967) (11 30 sec compression assumed in all cases						
509	58	17	5	15 58 42	87	345	0	0			
	58	17	20	15 58 12 5	57 5	287	5	0			
	68	17	5	15 68 42	117	585	5	0			
	68	17	20	15 68 12 5	87 5	437	5	0			
	90	17	6	15 90 42	147	735	0	5	Case 1 Bends two legs RC 100 ft Air Cured	H	CR
									Case 2 Hemiplegia hind quarters RC 165 ft Air Recurred on RC Killed	M	KILLED
									Case 3 Bends two legs RC 105 ft Air Paralysed hind legs during RC Left foreleg weak RC 150 ft Air Recurred on RC Killed	M	KILLED
	90	17	20	15 90 12 5	117 5	587	0	1	Case 4 Bend one leg RC 100 100 ft Cured	0	CR
	120	17	20	15 120 12 5	142 5	737	3	0			
	150	17	20	15 150 12 5	177 5	887	1	1	Case 5 Six four bends Collapse No decalin RC Air Not cured Assumed to be paralysed	M	KILLED
608	30	20	5	15 30 58	95	570	12	0			
	30	20	15	15 30 20	65	390	12	0			
	45	20	10	15 45 58	110	660	0	1	Case 6 Bend one leg Very distressed No RC available Recovered without RC	0	CR

Table 1 (Continued)

(1)	(2)	(3)		(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
					EATON (1967) I I (Cont)						
600	45	20	15	15 45 20	88	480	A	D			
	60	20	15	15 60 20	95	570	6	1	Case 7 Acute chokes 4 mins after Collapsed and died almost immediately	Ch	D ED
700	30	23	6	15 30 58	103	721	12	F	Case 8 Paralysed BC 165 ft Air Failed Killed	M	K ILLED
									Case 9 30 mins after dive poor collapsed and dred	DCHS DCh	D ED
									Case 10 Bend one leg Disturbed respiration BC 100 ft Air Cured	D DCh	CR
									Case 11 Bend one leg Paralysis BC 160 ft Air... Exited Killed	D M	KILLED
	45	23	D	15 45 58	110	826	A	3	Case 12 Paralysis hind legs BC 105 ft Air Failed to alleviate Killed	M	KILLED
									Case 13 Paralysis and total collapse BC 165 ft Air Ineffective Killed	D	CR
									Case 14 Paralysis hind quarters BC Ineffective Killed	M	KILLED
	45	23	15	15 45 24	84	568	A	D			
					EATON (1967) LILL						
550	10	10	D	15 10 34	58	324	30	D			
	10	10	A	15 10 46	71	398	29	D			
	15	10	D	15 15 34	84	352	29	D			
	15	10	A	15 15 46	76	418	29	D			
600	10	20	D	15 10 37 5	62 5	375	29	1	Case 1 Bends 3 legs Dyspnoea Collapse BC 60 ft O_2 Immediate recovery DC nitt 5 mins Diagnosis dismissed	D Ch M	CR
	10	20	A	15 10 58	75	450	29	D			
	15	20	D	15 15 37	67	405	29	D			

Table 1 (Continued)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
					RATON (1967) (11) (Cont)						
600	15	20	6	15 15 50	60	488	20	0			
650	10	22	8	15 10 40	65	422	20	0			
	10	22	M	15 10 54	78	513	20	2	Case 2 Bends two legs RC O_2 60 ft Recovered.	0	CR
									Case 3 Rotation to left General paralysis RC Air 90 160 96 82 55 ft bleed to AP Weak and ill Died	0 OTHER CNS	DIED
	15	22	0	15 15 40	70	455	26	0			
	15	22	8	15 15 54	84	546	26	1	Case 4 Bends three legs RC O_2 60 last for 5 hrs 41 mins Recovered	0	CR
700	10	23	0	15 10 44	69	483	24	1	Case 5 Bends both forelegs and one hind leg Dyspnoeic Collapsed Paralysed RC 60 ft O_2 hap 0 recovery	0 M Ch	CR
	10	23	6	15 10 50	83	581	24	3	Case 6 Bends two legs Improved RC 60 ft O_2 16 mins Bleed 1 hour ?Diagnosis	0	CR
									Case 7 Weak in hind legs Distressed Short RC 60 ft O_2 Recovered ?Diagnosis	M	Partial Recovery
									Case 8 Para yzed hind legs Improved Appeared normal without DC Some residual dragging of hind leg next day	M	PR
	15	23	6	15 15 58	88	616	21	1	Case 10 Bends and paralys s forelegs RC 60 ft O_2 On DC severe general paralysis Killed	0 M	KILLED
750	10	25	8	15 10 46	71	525	19	0			
	10	25	6	15 10 60	86	636	17	0			
	15	25	8	15 15 46	78	562	19	0			
	15	25	6	15 15 60	81	873	17	2	Case 11 Bends two legs later paralysed RC 60 ft O_2 Recovered	0 h	CR
									Case 12 Bends two legs Collapsed with severe paralysis RC O_2 60 ft Recovered	h	CR

Table 1 (Continued)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
					BAOMF (1967) (11) (Cont)						
770	10	27	8	15 10 48	73	562	19	1	Case 15 Weakness with hind legs Collapse RC 60 ft O_2 Walked normally after five mins Recovered	M	CR
	10	26	6	15 10 64	89	685	15	0			
	15	26	8	15 15 78	78	608	18	2	Case 14 Arched back Severe paralysis RC 60 ft O_2 Normal after a few secs Recovered	M	CR
									Case 15 Severe paralysis hind legs No RC available Deteriorated Killed	M	KILLED
	15	26	6	15 15 64	94	724	15	1	Case 16 Bent one leg Paralysis right hind leg RC 50 ft O_2 Recovered	B M	CR
600	10	27	8	15 10 50	75	600	15	2	Case 17 Paralysis with hind legs and one foreleg RC 60 ft O_2 Normal fn a few minutes O_2 Rapid Recovery	M	CR
									Case 18 Bends two legs Chokes Paralysis hind legs RC 60 ft O_2 Recovered	B	CR
	10	27	6	15 10 87	92	736	14	2	Case 19 Severe bend one leg RC 50 ft O_2 Recovered	B	CR
									Case 20 Bends three legs ??Paralysis RC 60 ft O_2 Recovered	B	CR
	15	27	8	15 15 50	60	440	15	1	Case 21 Bends two legs RC 60 ft O_2 Recovered	B	CR
	15	27	6	15 15 67	97	776	12	3	Case 22 Chokes R hd legs splayed RC 60 ft O_2 Recovered	Ch B	CR
									Case 23 Bends two legs RC 60 ft O_2 Recovered	B	CR
									Case 24 Collapsed with paralysed hind legs RC 6. ft O_2 Dramatic recovery Residual stiffness left hind leg	M	PR

Table 1 (Continued)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
					EATON (1969)						
650	5	26	8 5	12 5 5 38	55 5	361	12	II			
700	5	28	8 5	12 5 5 41	58 5	400	12	II			
750	5	30	8 5	12 5 5 44	61 5	461	12	II			
800	5	32	8 5	12 5 5 47	64 5	516	12	I			
850	5	34	8 5	12 5 5 50	67 5	576	12	II			
900	5	36	8 5	12 5 5 53	70 5	634	12	2	Nearly all animals appeared unwell two goats (1 and 2) with some degree of paralysis. Recovered without RC	M M	CR CR
950	5	38	8 5	12 5 5 56	73 5	698	12	2	All goats appeared unwell two goats (3 and 4) severe RCS Wet AC killed	M D	KILLED KILLED

Table 2 Simulated (chamber) and sea trial escapes carried out by Royal Naval personnel 1945 - 1970

(1)	(2)	(3)	(4)	(5)			(6)	(7)	(8)	(9)
MAX DEPTH (fsw)	TIME ON BOTTOM (mins)	RATE OF COMP (ft/sec)	RATE OF DECOMP (ft/sec)	TIME OF C 2 (sec)	TOB	EC 2	EQUIVALENT TIME ON BOTTOM (total of (5)) (sec)	TIME PRESS INDEX (DPdt x (6)x(7)) (100 ft/sec	NO OF ESCAPES	DETAILS
				COWAN WILSON DICKSON and WRIGHT 1947 (chamber)						
200	80	1 83	4 45	54 5	80	21 5	156	312	1	
	130	1 73	4 75	57 5	130	21	208 5	417	1	
	105	1 6	4 07	62 5	105	24 5	192	384	1	Compression and decompression approximately linear in time. All dives by Dr Wright
	110	1 64	4 25	61	110	23 5	194 5	389	1	
	112	2 1	4 55	47 5	112	22	181 5	399	1	
300	15	1_76	4 61	85 5	15	32 5	133	399	1	
				WRIGHT 1950 (chamber)						
200	60	2 08	4 54	48	60	22	130	260	24	
	60	2 17	2 22	46	60	45	151	302	8	
	60	2 74	1 08	36	60	93	158	370	3 (6)	Compression and decompression approximately linear Figures in brackets in column 8 are similar dives recorded but details are not available
300	60	3 00	3 80	50	60	40	150	450	2(26)	
	60	3 00	2 06	50	60	73	183	549	5(12)	
330	30	3 00	4 00	55	30	41	126	416	2	
				HMS Tireless August 1942 (sea escapes)						
125	17	nl	2	15	17	38	70	80	6	
175	25	nl	2	16	25	51	92	161	2	High pressure air equilibration. Latter half of compression much more rapid. Subjects decompressed in tower
225	18	nl	2	16	18	61	95	214	4	

Table 2 (continued)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
			HMS Tiptoe September 1962 (sea trials) UPSHOT I					
60	40	nl	6	15 40 5	60	36	26	High pressure air equilibration. Compression non-linear. Pressure doubled in 10 12 secs in last two series.
160	40	nl	5	16 40 17	73	117	12	
240	40	nl	5	16 40 23	79	190	12	
			BARNARD and EATON 1965 (chamber)					
300	40	15	5	10 40 30	90	240	10	Compression and decompression linear. * One type 11 DCS in last series at 500 ft. details reported in text
350	40	17 5	5	10 40 35	85	297	17	
400	40	20	5	10 40 40	90	360	10	
450	30	22 6	5	10 30 45	85	282	5	
500	30	25	5	10 20 50	80	400	5	
	30	25	5	11 5 27 50	86 5	442	3*	
			HMS Orpheus July 1965 (sea escapes) UPSHOT IV					
180	2	nl	0	11 2 11	24	44	10	Equilibrium by bleeding. Non linear decompression. Pressure doubled in 7 8 secs
280	2	nl	0	14 2 17	33	95	9	
350	2	nl	0	15 2 22	39	136	10	
400	2	nl	0	13 2 25	40	160	10	
460	2	nl	0	14 2 29	45	207	9	
			BARNARD and EATON 1970 (chamber)					
500	3	25	0 5	10 3 29	42	210	6	Compression linear
550	3	27 5	0 5	10 3 32	45	247	6	
600	3	30	0 5	10 3 35	48	288	6	
625	3	31	0 5	10 3 37	50	312	6	

Table 2 (continued)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
			RMS Osiris July 1970 (sea trials) UPSHOT V					
280	3	x2/5 sec	8 5	13 3 17	33	93	12	
330	3	x2/5 sec	8 5	15 3 19	37	122	3	
355	3	x2/5 sec	8 5	14 3 21	38	135	3	
380	3	x2/5 sec	8 5	14 3 22	39	148	3	
405	3	x2/5 sec	8 5	14 3 24	41	166	3	
430	3	x2/5 sec	8 5	14 3 25	42	181	3	
455	3	x2/5 sec	8 5	14 3 27	44	200	3	Equilibrium by flooding Pressure doubled approximately every 5 secs;
480	3	x2/5 sec	8 5	14 3 28	45	216	3	* One type II DCS in first series at 505 ft For details see text
505	3	x2/5 sec	8 5	12 3 30	47	237	3*	
505	3	x2/5 sec	8 5	11 3 30	45	227	2	
530	3	x2/5 sec	8 5	11 3 31	45	238	3	
555	3	x2/5 sec	8 5	11 3 33	47	261	3	
580	3	x2/5 sec	8 5	11 3 34	48	278	3	

Tab n 5 Nitrogen uptake of one kg of tissue with 1 ml/min perfusion a) blood (BO ccc000 half time tissue) during 500 ft submarine escape

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
TIME AFTER COMMENCEMENT (min)	RANGE OF ART CAP BLOOD N2 GAS TENSION (fsw)	MEAN PP (2)	(5) IN MTS	ART CAP BLOOD N2 NITROGEN TENSION (msw)	INITIAL TISSUE N2 NITROGEN TENSION (msw)	BLOOD TISSUE NITROGEN GRADIENT (gate)	EXCESS NITROGEN DURING TISSUE (ml/l) blood)	NITROGEN FLOW PER KG OVER PERIOD (ml)	TOTAL INPUT OF NITROGEN (ml)	TISSUE FRACTION = 1000 / (PPN + BLOOD FLOW (ml)	INPUT OF NITROGEN INTO TISSUE (ml)	SUMMATED INPUT OF NITROGEN INTO TISSUE (ml)	TISSUE NITROGEN TENSION (gate)	TISSUE NITROGEN TENSION (fsw)	STAGE OF ESCAPE
10 25	0 230	77	2 33	1 85	0	1 85	22 0	135	5 00	0 00	7 70	2 7	0 22	7 1	
25 30	230 100	320	8 68	7 87	0 22	7 65	88 0	45	4 00	0 00	5 90	4 0	0 14	17 0	COMP
30 33	500	500	10 30	12 2	0 54	11 66	142	27	5 83	0 075	1 74	10 34	0 85	28 0	BOTTOM
33 43	190 417	456	15 00	11 0	0 85	10 15	124	90	11 10	0 015	10 22	80.56	1 68	55 4	
43 58	417 333	375	11 32	8 0	1 68	7 12	89	90	8 1	0 0 5	7 17	73 66	2 29	75 3	
53 63	333 240	291	8 83	7 0	2 29	4 71	57 1	90	5 10	0 015	4 72	38.66	2.67	88 1	DECOMP
63 11	800 187	200	6 33	5 0	1 07	1 31	28 4	90	2 50	0 015	1 34	34 04	7 89	94 0	
73 83	187 83	125	5 00	5 0	1 00	0 14	1 7	90	0 15	0 015	0 14	35 00	2 07	95 0	
83 95	83 0	81 5	1 26	1 0	1 07	1 01	*22 0	90		*0 005	1 04	33 14	7 71	89 0	SURFACE
CALCULATION COMMENCING INCREASING TISSUE NITROGEN TENSION (5ate)															
10 25	0 830	77	2 33	1 00			22 0	135	5 90	0 00	2 70	0 27	0 22	7 1	
25 10	210 500	300	8 68	7 07	1	1	93 1	45	8 20	0 06	4 02	0 72	0 55	10 2	COMP
10 11	500	500	11 30	12 1	0	0	140 5	27	6 90	0 075	1 00	10 92	0 87	28 0	BOTTOM
11 41	500 417	458	15 90	11 0	0	0	134 2	90	11 80	0 01	10 90	21 12	1 70	10 1	
45 55	417 333	375	11 17	0 0	0	0	109 0	90	9 80	0 01	0 01	36 55	2 50	32.7	
55 63	333 260	291	8 86	7 0	0	0	85 4	90	7 69	0 01	7 05	37 60	5 80	101 7	
63 73	250 101	200	6 33	5 0	2	2	01 0	90	1 69	0 015	5 83	42 63	1 68	111	DECOMP
73 83	101 83	125	3 86	5 0	0	0	36 0	90	3 29	0 015	5 82	45 85	3 74	123 7	
83 00	83 0	41 5	1 26	1 0			12 2	90	1 10	0 00	1 01	48.66	1 85	125 2	SURFACE

* In this part of the ascent 100 - 93 decai tissue n trogen atcccde = ood nitrogen tension Excess nitrogen in the kilogram of t ssue is calculated (column 8) and partitioned to blood (note changed ficci ent

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Subarachnoid haemorrhage—New management strategy

C. D. Gillen

INTRODUCTION

The management of spontaneous subarachnoid haemorrhage has changed significantly in recent years.[1] Careful grading of the patient's clinical condition with a view to early surgical intervention for those in good grades can reduce the high morbidity and mortality associated with subarachnoid haemorrhage and particularly with re-bleeding. Early cerebral computerised tomographic (CT) scanning can confirm the diagnosis.[2] The calcium antagonist Nimodipine reduces the incidence of late ischaemic deficit and treatment should be started as soon as the diagnosis has been established.[3] The case histories outlined below serve to illustrate this management approach.

CASE REPORT 1

A 58 year old lady presented with a 4 hour history of sudden severe headache and vomiting. She remained fully conscious and alert with a moderately severe headache and neck stiffness but no neurological deficit (Hunt and Hess Grade II—See *Table I*). Cerebral CT scan confirmed the diagnosis of subarachnoid haemorrhage (*Figure 1*). Treatment was started with Nimodipine 60 mg orally 4 hourly and 48 hours after presentation an anterior cerebral artery aneurysm was clipped successfully. The patient made an excellent recovery and after three months had returned to a normal lifestyle without neurological or cognitive disability.

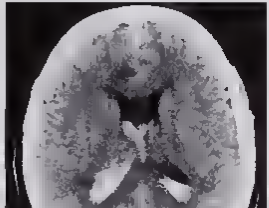

Fig. 1. Unenhanced CT scan showing accumulation of raised attenuation material in the lateral and third ventricles consistent with fresh blood. No ventricular dilatation present.

CASE REPORT 2

A 46 year old man presented with a 48 hour history of severe headache and drowsiness progressing to deep coma (Hunt and Hess Grade V—see *Table I*). Cerebral CT scan

Surgeon Lieutenant Commander Gillen is senior registrar in Medicine currently appointed to Royal Naval Hospital Haslar.

Table 1 Hunt and Hess grades (Reproduced by kind permission of Prescribers Journal

I	Asymptomatic or minimal headache with slight nuchal rigidity
II	Moderate to severe headache and/or nuchal rigidity but no neurological defect other than cranial nerve palsy
III	Drowsiness confusion or mild focal defect
IV	Stupor moderate to severe hemiparesis possibly early decerebrate rigidity and vegetative disturbance
V	Deep coma decerebrate rigidity moribund appearance

Note Severe systemic disease such as hypertension and diabetes result in reduction to a lower grade

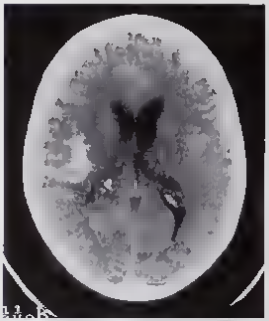

Fig 1 Unenhanced CT scan showing extensive serpiginous areas of raised attenuation in the right cerebral hemisphere consistent with fresh blood in the subarachnoid space

confirmed the diagnosis of subarachnoid haemorrhage (*Figure 2*) The patient was moribund and required assisted ventilation Nimodipine was given intravenously and later orally He remained unconscious for 8 days and was considered unfit for angiography or surgery On recovery on Day 16 he had a mild left hemiparesis but a moderately severe cognitive defect associated with personality change and aggression Serial CT scans showed the development of hydrocephalus which was shunted with significant improvement to his clinical condition

DISCUSSION

Primary subarachnoid haemorrhage has a mortality of 33% and high morbidity Prompt diagnosis based on the history examination and confirmed by CT scanning is essential Lumbar puncture may be hazardous[4] in view of the risk of pressure coning but still has a place in cases of diagnostic doubt and may still show xanthochromia when presentation has been delayed [5]

Clinical grading using one of the commonly employed systems (*Tables 1 and 2*) will identify patients who are suitable for early surgical intervention [6,7]

Patients in Grade I and II should be considered suitable for early surgery and transferred to a Neurosurgical Centre without delay

The calcium antagonist Nimodipine reduces the incidence of delayed ischaemic deficits and treatment should be started as soon as the diagnosis of subarachnoid haemorrhage has been made

Neurosurgical advice should be obtained in all cases and for hospitals with CT scanning facilities but without a neurosurgical unit the management plan below is suggested (*Figure 3*)

ACKNOWLEDGEMENTS

With thanks to Mr Michael Powell Consultant Neurosurgeon at the National Hospital for Nervous Disease Queen Square London and Prescribers' Journal for kind permission to reproduce Table 1 Also to Surgeon Commander J I C Hogg Consultant Radiologist RNH Haslar for kind assistance with CT scans

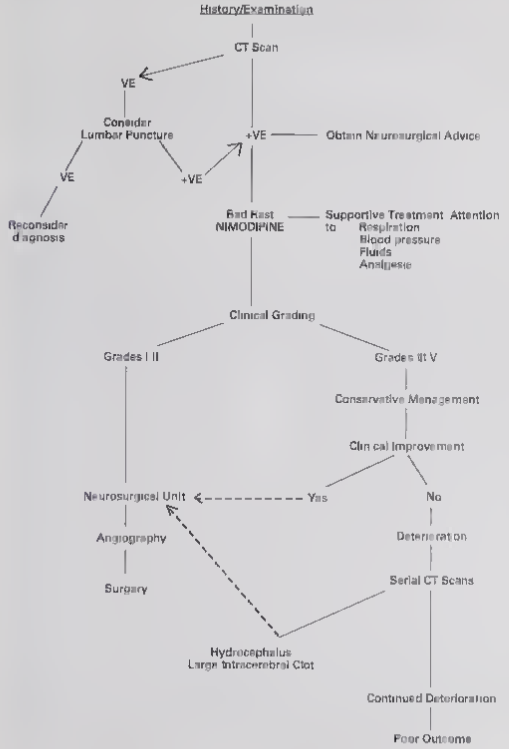

Fig 3 Management of subarachnoid haemorrhage

Table 2 Adaption of Glasgow Coma Scale

Grade	Glasgow Coma Scale	
I	15	Neurologically intact but for cranial nerve palsy
II	15	Neurologically intact but for cranial nerve palsy with neck stiffness or headache or both
III	13–14	With or without neurological deficit
IV	8–12	With or without neurological deficit
V	3–7	Coma with or without abnormal posturing

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An insight into the life of Royal Naval surgeons during the Napoleonic War. Part 1

J C Goddard

(This paper is based on a dissertation for the author's BSc research project)

INTRODUCTION

If a seaman was hurt as a result of his own misconduct such as fighting or drunkenness the Master of the ship was under no obligation to provide treatment for him but if the injury or sickness was sustained during the course of his duty on board ship then according to Article Seven of the Laws of Oleron

> the master ought to set hym out of the shyp and seke lodgynge for hym And ought for to fynde hym lyght as talowe or candell and to gyve hym a lad of the shyp for to take heed of hym or hyre a woman to kepe hym and ought to purvey hym of suche meat as is used in the shyp And yf the shyppe be redy to departe it aught not to tarry for hym and yf he recover to have his hyre in payinge and rebatynge that the maysster layde out for hym And if he dye his wife or next kynne or frende ought to have it for hym [1]

This is an extract from the Laws of Oleron which were introduced by Queen Eleanor the widow of King Henry II while she was acting as vice-regent for King Richard I at the end of the twelfth century

Thus from this time onward the English seaman was to be given the provision of care when he fell sick while carrying out his duty By the eighteenth century every ship of the Royal Navy carried at least one medical man and a Board for Sick and Hurt Seamen originally established in 1653 existed to oversee the care of diseased and wounded crewmen of the fleet and as a controlling body for the navy's medical men

By 1796 the terms of reference for this body could be listed as follows

1 Prevention of disease by examination and if necessary the rejection of recruits
2 To superintend the preparation and issuing of medical stores
3 Employment of the most effectual means of preventing scurvy
4 Inspection of the provisions and clothes on board ship
5 To take the most effectual means to procure respectable and well qualified candidates for medical situations for the fleet and hospitals
6 Superintending the examination of candidates
7 Any difference of opinion on subjects purely medical was to be referred to the Surgeons Company and the College of Physicians [2]

The aim of this paper is to look at the life and work of those men of the Royal Navy whose duty it was to care for the health of the officers and men of His Majesty's ships during the period from 1790 to 1815 approximately the period when Great Britain and France were engaged in the Revolutionary and Napoleonic Wars It will illustrate the conditions under which these men lived and worked and examine the situation they found themselves in both medically and socially and the attempts they made to change their situation

Mr Goddard is a medical student at the London Hospital

The study will examine the progress of the naval surgeon throughout the period Changes in the status the living and working conditions the pay and the skills of the surgeons will be examined and how all these factors might have affected the health of the men under their care It will also examine the reasons for these changes and where the impetus may have originated

Much of the data used for this study has been obtained from the original surgeons Journals written during the period under review Every naval surgeon was obliged to keep an official medical and surgical Jonrnal on all voyages one copy of this was to be sent to the Commissioners for the Sick and Hurt Board and a second copy to the Company of Surgeons for inspection The Journal was to show the name rank and age of all those admitted to the sick list the date of admission and where the ship was stationed at the time The ailment and prevailing symptoms were to be given the recommended treatment and the history of the case as it progressed Finally the date had to be given when the patient was returned to duty was sent to hospital or died

The richest information in these Journals comes, however not from the case histories although these do provide a fascinating insight into the medical and surgical procedures undertaken at the time but from the additional comments and remarks made by the surgeons as background information Despite the fact that every naval surgeon was obliged to write and return two copies of his Journal for every voyage (this was later reduced to one) there are distressingly few extant A great many have been lost or destroyed over the years because they were not considered to be of sufficient importance and therefore were not very carefully preserved The quotations I have extracted from the Journals I hope will give support to the paper and fit into the context of the account as a whole I have attempted to find fresh extracts from the manuscripts to illustrate certain points rather than using examples previously cited in the literature Wherever possible I have taken the quotations directly from the manuscripts in order to view them in perspective

THE SURGEON S LOT

The Medical Department of the Navy although it speaks but little in praise of the wisdom of those who planned it is certainly an excellent proof of the patience of their posterity who have so suffered it to remain unimproved It was bad in its first institution and it has been generally growing worse [3]

This snide and scathing comment on the medical department of the Royal Navy appeared in the Monthly Review of 1790 and was based on Thomas Trotter s lately published pamphlet[4] calling for the reform of naval medicine The poor state of medicine in the Royal Navy and the consequent bad health of the British seaman reflected upon and may even have been caused by that mainstay of the naval medical department the ship's surgeon

Tradition dictates that the position of ship's surgeon be a lowly one This was true before the period under scrutiny and continued to be so long after To be a member of the healing profession in the closing years of the eighteenth century on either land or sea was to be a man of no particularly great standing. With the exceptions of those who were lucky enough to find themselves at the top of the medical tree, being Fellows of the Royal College of Physicians or Company of Surgeons medical men were not well endowed with wealth position or social status It could hardly even be said that they were members of a medical profession as the ever warring branches of medicine the physicians the surgeons and the apothecaries maintained (or attempted to maintain) suitable professional chasms between each branch and particularly not a profession of any exceptional or established standing such as law the church or the army The naval surgeon thus found himself at the very bottom of this healing hierarchy his position was considered to be the lowest of medical employment and generally as a situation of last resort He consequently found himself well positioned to receive the contempt of his (slightly) better placed landlubber' colleagues and to be ignored by his medical and nautical overseers

The position of naval surgeon was a situation in limbo Although employed by the Royal Navy the surgeon was considered a civilian he was not given a commission by the Admiralty but received a warrant from the Navy Board His official position was therefore as a Warrant Officer of Wardroom rank In status he outranked his fellow civilian officer the purser but he ranked lower than the master with whom he had equality of pay He had no officer s powers This must have been felt both by the surgeons themselves and the rest of the ship s company To emphasise this point the surgeon had no uniform this may seem a very minor detail but

In the confines of a warship the surgeon's civilian clothing must always have been a reminder of his inferior status

As previously mentioned the surgeon's pay equalled that of the master and this amounted to five pounds per month This sum however was paid only to full surgeons not to surgeon's mates who were paid according to their rank first second or third mate In the memoirs of his life as a naval surgeon during the period under review Peter Callea[4] records that at the beginning of his career (he passed as a surgeon's mate in December 1789) the pay of a surgeon's mate ranged from two to three pounds per month

The majority of naval surgeons were employed on warships in the various stations around the world. The number of warships and therefore the number of naval surgeons depended upon whether Great Britain was at war and also to some extent with whom as hostilities with a more powerful country would require a larger navy When Great Britain was not at war the size of the Royal Navy was reduced In peacetime therefore many naval surgeons might find themselves unable to get a warrant on a ship and thus be out of a job Additionally when the ship put into port for repairs the crew might be paid off so the surgeon would again have to look for another warrant Although the navy for much of the period under review can be seen to be suffering from a lack of surgeons and thus constantly trying to employ them this was not always the case particularly for the less well qualified surgeons' mates In his novel *The Adventures of Roderick Random*[5] Tobias Smollett[6] depicts the difficulty that his hero a prospective naval surgeon is warned to expect in getting a warrant

> I believe it will be a difficult matter to procure a warrant there being already such a swarm of Scotch surgeons at the Navy Office in expectation of the next vacancy that the commissioners are afraid of being torn to pieces and have actually applied for a guard to protect them

the hero is told, and a fellow candidate informs him

> that he himself had passed for third mate of a third rate about four months ago since which time he had constantly attended the Navy Office in the hope of a warrant '

Although this is a novel Smollett himself was a naval surgeon before turning to the more rewarding occupation of author It is therefore most probable that some parts of the book are based on truth albeit somewhat exaggerated

One solution that was put forward to solve the pay problem was to put the surgeons on half pay when they were not on active service Although this would be a meagre amount, it would at least give them a little to live on while they tried to gain a warrant on a new ship or until they found other employment. However this privilege was only granted to the top surgeons of the Navy (the top 200–300 according to Cullen[3]) This left many of the more lowly surgeons on no pay at all It was these surgeons and surgeons' mates who would find it most difficult to find new ships and were thus left impoverished while so doing

This granting of half pay to only the top few surgeons was a cause of considerable distress to the more lowly surgeons They not only found themselves with no money if their warrant was not renewed but saw some of their more established colleagues being paid while they themselves remained poor

The surgeons pay small though it was was then further diminished before they had even time to count it for each surgeon was required to provide his own chest of instruments and was also responsible for the provision of medicines for the ship

The surgeon's instrument chest was a very expensive article a list of the recommended contents is given in *Figure 1* Although this list is dated 1812 it would be very similar to that of the 1790s and as can be seen is quite extensive Obviously all of these instruments had to be carried on the ship because the surgeon might be called upon to deal with a very wide range of conditions and as he would most probably be unable to get ashore, he would have to have everything he required at hand To this end it was stated in the naval regulations of 1731 that the instrument chest of every naval surgeon had to be examined by the physician at the Royal Naval Hospital at Greenwich and also by the Company of Surgeons. This privilege was granted to the Surgeons in 1629 by a charter of Charles I and, for some reason was an entitlement they highly regarded and fought hard to retain After the chest had been examined it was to be locked and the seals of the Physician and of the Surgeons Company to be affixed thereto in such a manner as to prevent its being afterwards opened before it comes on board nor is the captain to admit any Chest into the Ship without these marks upon it ' These

regulations were to ensure that each surgeon had the correct instruments and in sufficient quantity to cover all eventualities of his duties at sea. The chest was sealed after being examined to prevent the surgeon selling some of the instruments before he sailed in order to reimburse himself of some of the expense of its purchase. That this precaution was considered necessary again demonstrates the hardships of the young surgeons.

The surgeons also had to provide a chest of medicines for the ship. The privilege of determining which medicines should be included and also of providing them went this time to the Society of Apothecaries. The surgeon had no choice but to purchase his drugs from the Apothecaries and perforce paid more for them than what he would pay for similar articles in other places [3].

However unlike his instruments the cost of the ship's medicaments did not entirely lay with the surgeon. Although the initial outlay was his the sum was partly reimbursed by the Navy Board this was known as the King's Bounty. This allowance for a senior surgeon was £33 9s 0d (£33.45). In 1779 this was increased to £50 3s 6d (£50.17½) and again in 1781 to £62 [3]. The surgeon also received certain perquisites from the seamen themselves to go towards the cost of their treatment. However these contributions were never enough to fully compensate the surgeon and so the cost of the ship's medicines was another drain on his salary.

In 1790 Trotter recognised the immediate temptation that would be forced upon the surgeon by this further financial burden and the problems of a greater drop in the quality of naval health care:

> In consequence (of the price of drugs) it becomes his (the surgeon's) interest to give little medicine and that little of as cheap a quality as possible when perhaps the nature of the disorder may require expensive remedies in large quantities [2].

A list of the drugs recommended by the Society of Apothecaries is given in *Figure 2*.

As well as the privilege of examining the contents of the surgeon's instrument chest the Company of Surgeons also had the task of examining the surgeons themselves. This too had been granted to them in the same Royal Charter of 1629 [1].

The candidates were expected to have already served an apprenticeship under a qualified surgeon on land and had to present themselves for examination by the Company at Surgeons' Hall in London on specified days. Many of the prospective surgeons came from Scotland or had studied at the universities there. For example Peter Cullen[2] studied anatomy physiology surgery midwifery and the theory and practice of physic at Edinburgh in 1787. However like many of his fellows he did not matriculate.

Examination by the Surgeons cost the candidate a guinea and he would then be given a certificate to be presented to the Navy Board the following day. This certificate told him at what level he had passed and for what position he could apply. Surgeons were passed as full surgeons or as first second or third mates, and their attainment at this examination decided in what type of ship they could serve.

The ships were designated different rates depending upon their size and the number of guns carried. Thus a surgeon's first mate in a second rate might transfer to the position of second mate in a first rate and consider this a step up the promotion ladder. Cullen[2] gives a description of the number of surgeons and mates in the various types of ship which indicates their relative positions:

> Cutters of 8 or 12 guns had Surgeons who had passed exams at first rate. Cutters had no mates. Briggs Sloops of War and small Frigates (20 guns) had an assistant surgeon. Frigates 30–50 guns had two. Ships of the Line 60–80 guns had three, and First and Second rate ships had five.

According to Wakeley [1] surgeons' mates could enter for the Company's examination at the age of sixteen. It lasted a quarter of an hour and was very easy. However the best first hand account of the actual examination is that of Cullen [2]. He took the examination at Surgeons' Hall at seven o'clock in the evening on 3 December 1789:

> (Cullen) made himself thoroughly acquainted with every surgical question or case that could possibly be propounded to him and went confidently in before these metropolitan gentlemen of the Faculty. The examiners were seated at a semicircular table where there were two or more candidates standing before it and answering such questions as were put to them. Mr Cullen walked up to the table and made his bow was asked his name from whence he came and for what purpose he meant to be

2 amputating knives
1 amputating saw with spare blade
1 metacarpal saw with spare blade
2 catlins (double edged amputating knives)
Pair of artery forceps
2 doz curved needles
2 tenaculums (hooks for holding parts)
6 Petit's screw tourniquets
Pair of bone nippers and turnscrew
3 trephines
Saw for the head (Hey's saw for enlarging cranial orifice made by trephine)
Rasps (raspatories or files)
Pair of forceps
Elevator
Brush
2 trocars (tube for withdrawing fluid)
2 silver catheters (tube for drawing off urine)
2 gum elastic catheters
6 scalpels
1 small razor
Key tooth instrument (for extraction teeth by torsion)
Gum lancet (for lancing gum boils)
2 pairs tooth forceps
Punch
2 Seton needles (for drawing silk through the skin to leave a tract for discharge)
Pair of strong probe scissors
Curved bistory with button (scalpel)
Long probe
Pair of bullet forceps
Scoop for extracting balls
2 probangs (thread sponges)
1 lb ligature thread
1 paper of needles
Case with lint
Apparatus for restoring suspended animation
Set of pocket instruments
6 lancets in a case
2 pint pewter clyster syringes (enema syringes)
2 sets common splints
Set of japanned iron splints for legs
12 flannel or linen rolled bandages
2 18-tailed bandages
20 yards of cloth for tourniquets
60 yards of tape
Cupping apparatus consisting of 1 scarificator and 6 glasses

This chest was provided by Messrs Evans and Co of Old Change When examined by the Court of Examiners it was recommended that the following be removed the lenticular from the apparatus for restoring suspended animation as being useless and dangerous and the probe scissors as improper for use in surgery

Fig 1 List of surgical instruments to be included in the Naval surgeon's chest

examined? On answering that it was for the Naval Service one of the examiners arose and taking Mr Cullen to the side of the room enquired his age his apprenticeship studies and practice in his profession To all of these Mr Cullen having returned a satisfactory

Peruvian bark
Calomel
Emetic tatar
Ipecacuanha
Opium
Purging salts
Senna leaves
Aloes
Ammoniacum
Balsam of Copaiba
Cantharides
Capsicum
Traumatic Balsam
Camphor
Castor
Chamomile flowers or Hops
Cinnamon
Prepared Chalk or Oyster shells
Conserve of Roses
Cordial confection
Cathartic extract
Extract of Hemlock
Extract of Dogwood
Gentian
Dried Squills
Golden Sulphur of Antimony
Flower of Sulphur
Cream of Tartar
Vinegar
White Vitriol
Wormwood
Flowers of Zinc

Ginger
Gum Arabic
Gum Guaiacum
Powder of Jalap
Laudanum
Linseed
Magnesia
Manna
Whole mustard seed
Myrrh
Crude mercury
Corrosive Sublimate
Nitre
Oil of Almonds
Castor oil
Linseed oil
Essential oil of Mint
Jamaica pepper
Blistering plaster
Onessie
Salt of Hartshorn
Salt of Steel
Salt of Wormwood
Castile Soap
Sarsaparilla
Saltpentery
Spermaceti
Rectified Spirit of wine
Weak spirit of Vitriol
Spirit of Minderarus
Spirit of Turpentine

Fig. 2. Drugs recommended for the naval surgeon's medical chest

reply the examiner proceeded to question him on anatomy physiology and surgery Then stated some of the more important surgical cases or disease and how he would treat them This gentleman was quite satisfied with Mr Cullen's proficiency and taking him up to the centre of the table where the president bowed to Mr Cullen and desired him to pay one guinea as a fee and to call the next day at the Navy Office where he would find a certificate of his having passed Mr Cullen then bowed and retired He got over the examination better than he expected for he had been led to believe that the Faculty of London were not well disposed to candidates from Edinburgh from a spirit of envy

Cullen procured a warrant to serve as Assistant Surgeon to HMS *Squirrel* Although the examination as described above does not appear long or very extensive it does give the impression that the prospective naval surgeon had to have at least some knowledge of surgical practice and also to have served a suitable apprenticeship It is very different from the hilarious farce depicted by Smollett[6] when his fictional Roderick Random is examined in Surgeons Hall He describes one young fellow (who) came out from the place of examination with a pale countenance his lip quivering and his looks as wild as he had seen a ghost and when Random himself is examined he is asked If during an engagement at sea a man should be brought to you with his head shot off how would you behave?

The conditions in which the naval surgeon had to live and work were exceedingly poor The wooden ships of the eighteenth century were insanitary and massively overcrowded HMS *Victory* 186 feet long with a displacement of 2164 tons would have a crew of 900 men The crew of a much smaller third rate vessel of 1800 tons might number 600 men

Many of the ships were filthy and infested

with vermin The extent of this can be seen in the entry for 12 May 1789 in Thomas Simpson's Journal[9] on board HMS *Kangaroo*

> These two days past have been employed in clearing ship of all her stores and ballast in order to destroy the Rats which are very numerous This day the 12th we have all the hold the magazine and store rooms clean washed out with boiling vinegar and stoves light (sic) to dry them—We have in the course of getting out the stores killed about 300 large overgrown rats besides as many small ones And I have fumigated with the Nitrous Acid twice

The surgeon being of wardroom rank might be berthed with the officers and some even had their own cabin This was more than likely situated on the lower gun deck In bad weather the gun ports of this cramped deck would be battened down to prevent the deck being swamped with water rendering the air stifling and foul and making it very unpleasant indeed Even worse would be the orlop deck this was the lowest deck of all below the lower gun deck and situated below the water line Cullen being an assistant surgeon found himself living with the midshipmen in their mess on this deck

Also situated on the orlop deck would be the surgeon s cockpit This was the place where operations were carried out and where the wounded were brought for the surgeon s attention during a battle It was generally damp suffocatingly close and very dim being poorly lit by candles and lanterns This bad light could severely handicap the surgeon s work and caused one surgeon to write in his Journal[9] 'Had the sick berth been light I should have discovered his complaint sooner'

During an engagement the cockpit provided the surgeon with the worst imaginable conditions in which to carry out his work In an action of any size the small area invariably became crowded with dead and wounded men The cramped conditions poor ventilation and heat of the battle with the heavy guns of the lower deck thundering above the surgeon s head would cause an unbearably high temperature particularly on more tropical stations a high noise level poor visibility and unsteady conditions Of the few accounts of the surgeon s cockpit during a battle that of Robert Young surgeon of HMS *Ardent* is probably the most graphic and illustrative The *Ardent* was one of the 16 British ships that under the command of Admiral Duncan engaged the same number of Dutch vessels, under Admiral de Winter at the Battle of Camperdown on 11 October 1797 After compiling a casualty list for the *Ardent* Young wrote an account[10] of his experience in the battle.

> All of these were wounded in the action of the eleventh of October in which I had no mate having been without one for three months before I was employed in operating and dressing till nearly four in the morning the action beginning about one—afternoon So great was my fatigue that I began several amputations under a dread of sinking before I should have secured the blood vessels
>
> Ninety wounded were brought down during the action the whole cockpit cabin wing berths and part of the cable tier together with my platform and my preparations for dressing were covered with them so that for a time they were laid on each other at the foot of the ladder where they were brought down and I was obliged to go on deck to the Commanding Officer to state the situation and apply for men to go down the main hatchway and move the foremost of the wounded further forward into the tiers and wings and thus make room in the Cockpit Numbers about sixteen mortally wounded died after they were brought down amongst whom was the brave and worthy Captain Burgess whose corpse with difficulty he got conveyed to the starboard wing berth Joseph Bonhem had his right thigh taken off by a cannon shot close to the pelvis so that was impossible to apply a tourniquet his right arm was also shot to pieces The stump of the thigh which was very fleshy presented a dreadful and large surface of mangled flesh in this state he lived near two hours perfectly sensible and incessantly calling out in a strong voice for me to assist him The bleeding from the femoral artery although so high up must have been very inconsiderable and I observed it did not bleed as he lay All the service I could render the unfortunate man was to put a dressing over the part and give him a drink In many other instances today I had occasion to observe that vessels collapse and bleed little after gun shot or splinter wounds The vessel probably stretched longitudinally has its side brought together and its cavity diminished when at length transversely separated by violence the jaggered ends retract inward which with the spasmodic contraction of the circular fibres of

the artery occasioned by the tension completely closes the passage and resists the impetus of the blood from above. Whether this attempt to explain be just or not, the fact is deserving of notice at the same time I am aware that it does not hold universally true. Melancholy cries for assistance were addressed to me from every side by wounded and dying, and piteous groans and bewailings from pain and despair. In the midst of these agonizing scenes I was enabled to preserve myself firm and collected, and embracing in my mind the whole situation to direct my attentions where the greatest and most essential services could be performed. Some with wounds bad indeed, and painful but slight in comparison with the dreadful condition of other were most vociferous for my assistance; these I was obliged to reprimand with severity as their noise disturbed that last moments of the dying. I cheered and commended the patient fortitude of others, and sometimes exhorted a smile of satisfaction from the mangled sufferers, and succeeded to throw momentary gleams of cheerfulness amidst so many horrors. The man whose leg I first amputated, Richard Traverse, had not uttered a groan or complaint from the time he was brought down, and several exulting in the news of the victory declared they regretted not the loss of their limbs.

An explosion of a salt box with several cartridges, abreast of the Cockpit hatchway, filled the hatchway with flame, and in a moment fourteen or fifteen wretches tumbled down upon each other, their faces black as a cinder, the clothes blown to shatters, and the rags on fire. A Corporal of Marines lived two hours after the action with all the gluteal muscles shot away so as to excavate the pelvis. Captain Burgess's wound was of this nature, but he fortunately died almost instantly. After the action, ceased fifteen or sixteen dead bodies were removed before it was possible to get a platform cleared and come at the materials for operating and dressing those I had prepared being covered over with bodies and blood, and the store room door blocked up. I have the satisfaction to say that of those who survived to undergo amputation or be dressed, all were found next morning in the Gun Room where they were placed in as comfortable state as possible and on the third day were conveyed on shore in a [word illegible in MS] in good spirits, cheering the ship as going away, smoking their pipes and jesting as they sailed along, and answering the cheers of thousands of the populace who received them at Yarmouth Key (sic).

The ship's sick berth was not necessarily in the same place as the cockpit. A space would be assigned for the sick by the captain, and this was frequently either under the forecastle or just been a space between two gun ports. Blane described the sick berth as the interval between two guns or any space between decks which is sometimes formed into a sort of apartment by means of a partition made of canvas.

A badly placed sick berth could be very deleterious to the health of the occupants. Some of the sick might be placed in the fore-part of the hold which was damp, unwholesome and filled with stench from the bilges'.[1] This would be a particularly noisome place low down in the ship for the ballast in the very bottom was very foul and unhealthy. Jason Farquar, surgeon of HMS *Captain*, complained that the sick berth was small and uncomfortable and the ship in general very dirty.[2] While George McGrath, surgeon of HMS *Russel* reported in his Journal[3] that many of the sick on board had to be sent to the hospital at Plymouth rather than remain in the sick berth, giving as his reason that there was but a very poor accommodation for sick men on board of the Russel which was both cold, damp and even sometimes wet as the weather during the time we fitted out there was raining without intermission—this circumstance alone produced a vast number of diseases during our stay there.[4]

Thus it can be seen that at this time the naval surgeon's lot (like that of Mr Gilbert's policeman) was not a happy one. The poor pay, low status and bad living and working conditions made the position of ship's surgeon rather undesirable. Therefore most of those who wished to enter the medical profession endeavoured to find a position in a land-based practice. This meant to some extent that the surgeons who found themselves forced to resort to the sea for a living were the ones who were not as proficient and had failed to make a more lucrative living on land. This of course did not include all naval surgeons, for there were probably many who truly wished to be one, perhaps because of family connections with the sea, or perhaps from a sense of patriotism.

WHEN BRITANNIA RULED THE WAVES

Great Britain, being an island kingdom, has

necessarily always had particularly close connections with the sea It has always been not only a nation of shopkeepers but M Bonaparte notwithstanding a nation of mariners and since at least the time of King Alfred the Great a navy has played a major part in its wartime activities

Throughout the earlier part of the eighteenth century the Royal Navy had been kept suitably occupied with intermittent campaigns and wars with various adversaries notably the Seven Years War (1756–1762) the War of the Austrian Succession (1740–1742) and the War of American Independence (1774–1783) On 8 February 1793 Europe's newest republic France declared war on England [12] For the next 22 years with the exception of 1801 following the Peace of Amiens Great Britain was battling with France in the Napoleonic War

With France being much larger than Great Britain and thus having available a much larger fighting force it was recognised that total command of the seas by the Royal Navy was a crucial aspect of this war The size of the Royal Navy had therefore to be increased to meet the task before it At the beginning of 1793 the navy comprised 29 368 men During that year numbers rose to 45 000 to 120 000 in 1797 and to 140 000 in 1815 Obviously as the size of the navy increased so did the number of surgeons required to look after all these extra seamen

As has been previously mentioned the position of naval surgeon was generally one not eagerly sought after As the size of the fleet increased so the navy tried to recruit more surgeons, and increasingly found difficulty in so doing The army was similarly increasing in size and so also required more surgeons This of course diverted more medical men away from the sea particularly because of the relatively better status of army surgeons compared with their naval counterparts

The disparity with the military was quickly remarked on by those both high and low in the navy and many missives were sent warning of the consequences and suggesting remedies throughout the duration of the war This inequality had already been noted in 1781 by one Dr Robert Robertson who called for the status of naval surgeons to maintain a parity with those of the army In September of 1797 several Royal Navy surgeons sent a petition directly to the Admiralty asking for equality and Lord Nelson himself took up the matter in a letter dated 30 May 1804 to the Inspector General of Naval Hospitals Dr Baird After complimenting a particular naval surgeon a Mr Monrath Nelson warns:

> but we must love such men from our service if the Army goes on in encouraging medical men whilst we do nothing. I am sure much ought to be done for our naval surgeons or how can we expect to keep valuable men?

There were not many patriotic men who were good surgeons and who were also willing to join His Majesty's Navy What therefore happened was inevitable the navy was forced to accept candidates who were inferior It has already been seen that the Company of Surgeons examination for naval surgeons was not very demanding. By dropping the requirements further this brought in a few surgeons who were unfortunately lacking in surgical knowledge and skills their achievements ranging from poor to downright incompetent However as the Commissioners for the Sick and Hurt Board themselves pointed out, no properly qualified surgeon would be likely to join the service as long as the pay was only 2s 6d (12½ pence) a day

In 1798 Sir William Dillon noted the case of one surgeon Thomas Grey who although an excellent scholar being near-sighted with a defect in one of his eyes we did not place much reliance in his abilities at amputation. Although no doubt in throwing on this man's intellectual abilities it is remarkable that anyone so obviously deficient in the practice of surgical techniques could be regarded as a fully competent ship's surgeon Amputation was at this time the most frequent surgical procedure carried out particularly in wartime

Thomas Grey at least was intellectually competent but the surgeons' mates of whom Mr Whyte surgeon of HMS *Atlas* wrote appeared to be of more doubtful ability for he wrote at the beginning of his Journal that his third mate was so badly educated that he could neither understand Latin nor spell the commonest English words and that the first mate was incompetent for his duties although his exterior was plausible but was more ignorant than the third mate With regard to Mr Whyte's second mate he could neither perform a simple operation of venesection nor make up the most common medical preparations It was obvious that these men must have passed through a very lax examining system at Surgeons Hall

The expansion of the Royal Navy to face the

French fleet and her allies not only required more surgeons but of course, more ordinary sailors. The flood of men into the navy particularly from the towns brought epidemics of various diseases with them diseases such as typhus and influenza which once introduced could spread through the fleet and reek havoc crippling the ships as they lay in harbour As it happened, the occurrences were not as severe as had been previously In 1797 the surgeon of HMS *La Virginie* remarked [9] We received some men from the (illegible in MS) receiving ship at Spithead who appeared perfectly well but who introduced some contagion However all was not lost for from removing all who were diseased into a birth (sic) by themselves we eradicated the infection In 1800, HMS *Renard* was hit by quite an extensive outbreak of ship fever The surgeon Patrick Mullane blamed this on men coming from a duty ship and bringing the fever with them [15]

The warships required large crews to sail them and to man their many guns and the hard life of the sailor was well known and feared The health of the seamen, especially on foreign stations was much worse than that of men employed on land Seamen,' wrote Blane are in general short lived and have their constitutions worn out ten years before the rest of laborious part of Mankind. Trotter however was more to the point remarking that few of them live to be very old [16] Discipline was notoriously severe and of course there was always the possibility of being killed during an engagement The Admiralty always faced recruitment problems as there were never enough volunteers to fill the ships and so other means of building the nation's naval defences had to be employed

In 1795 a Quota Act was passed This ordered every county and borough to provide a certain number of men for naval service If there were insufficient volunteers local magistrates were empowered to comb the workhouses and gaols for men to make up the quota. These men often tended to be in ill health and so the practice frequently introduced "gaol fever" to the ships This disease was the same as ship fever although the two were separately identified at this time

Another way the navy filled its ranks was by impressment It was considered perfectly legal for the ship's captain to obtain crew for his vessel by taking men against their will often by violent means Press gangs were sent out to capture unsuspecting men and were the terror of the port towns lurking at night particularly around public houses and dragging their victims back to the ship where they became unwillingly sailors in His Majesty's Navy until such time as the ship paid off or like so many others they met their end at sea. The press gangs could also grab men from other ships. This practice also generated the risk of bringing aboard diseases particularly as it was from the more unsavoury areas of town that the men were usually taken HMS *La Virginie* surgeon[9] also commeats on this problem "I went on board the Cartex from Sea to investigate the state of health of the people prior to our impressing some of them and finding them apparently perfectly healthy we admitted about 14 most of whom shortly after coming on board had febrile complaints and by the foregoing we contracted the contagion

In addition to men who were weakened by disease those who were healthy in body suffered the psychological problems of anyone who is dragged away from his home and sent to sea Impressment was also unpopular with the sailors themselves as the use of press gangs led to very bad feeling towards the navy in the ports Many people complained fiercely about this barbaric way of manning the fleet but impressment continued to be practised for the benefit of King and Country well into the nineteenth century

A further influx of disease came from the French themselves The French fleet was much less healthy than the British and contact with the French invariably led to the passing on of some contagious disease. Once again the surgeon of HMS *La Virginie* comments in his Journal entry for 9 October 1797 [9] In the prior part of my servitude on board *La Virginie* the people were remarkably healthy not a symptom of fever appeared until we took on board some French prisoners some of our men were attacked particularly the Marines who were Sentries over the hatchways

When an enemy vessel and its contents were captured the money raised from this prize was divided between the officers and men including the surgeons, of the capturing ship It was advantageous therefore to capture the French ships and take them back to port However the British sailors who acted as crew for these prizes were once again often struck down by disease passed on from the French B F Ontram the surgeon of HMS *La Nymphe* wrote against the entry in his Journal[17] for 22 April 1797 that he was distressed to find the

fever increasing among the ship's company especially those who were on board the prizes and continues A variety of circumstances convince me that we are indebted to our communications with the French ships and prisoners for the source of contagion producing the fever that affects our ship's company[17]

It would probably be fair to say that, due to the Napoleonic War there was a decline in the health of the Royal Navy This was partly due to the greater numbers of seamen for although the health status of the average sailor remained unchanged the numbers of sick increased. In addition the number of wounds increased because there was a war on Wounds were always a major factor in naval medicine but were more sporadic when the ships were not engaged in action although when they were the carnage was terrible For example at the Battle of the Glorious First of June in 1794 287 British seamen were killed and 821 wounded at the Nile in 1798 218 were killed and 677 wounded and at Trafalgar in 1805 449 were killed and 1241 wounded

During war the naval surgeon saw and had to cure or attempt to cure a great variety of diseases which would never be seen in peacetime nor on land Many of the surgeons therefore in a period when medicine and surgery were learnt to a great extent by experience would have considerably advanced their medical education and improved their surgical skills. They would have to deal with a multitude of horrendous wounds while at the same time coping with the diseases which could spread through a ship's company leaving dozens of men incapacitated Service on foreign stations gave rise to outbreaks of tropical disease each place being notorious for different maladies The surgeons were often forced to experiment in order to save lives Surgeon Warner of HMS *Alfred* reports[18] an epidemic of fever which attacked the ship while at Port Royal in Jamaica in July 1796 and which continued to rage until the following October The requirement for a greater number of surgeons had already forced the Navy Board to lower their entrance requirements and to accept inferior candidates thus opening the possibility of lowering health standards still further However the surgeons still struggled to maintain the health of those in their care The increase in clinical material gave the surgeons a greater understanding of disease and in addition they were not afraid to use the knowledge gained by this experience to challenge the orthodox texts They improved their surgical skills by practice In this way the war despite being directly deleterious to the lives and health of many seamen may have made a contribution towards improvements in naval medicine.

THE CLAP AND THE CANNONS

The disorders which were brought to the surgeon were many From smallpox to syphilis, musket wounds to toothache the conditions which the surgeons faced ranged from the nauseous to the hilarious There were some complaints so common that they were noted in every surgeon's Journal and others as unfamiliar as being struck by lightning or gored by a bull The naval surgeon had to be prepared to meet every eventuality

It was this necessity for the ship's surgeon to be able to treat the multiplicity of cases with which he was faced that led him to follow a somewhat different career to that of the medical man on land By definition a surgeon was someone who practised external medicine that is operations involving the knife and the treatment of conditions such as ulcers by the application of external medicines This was different to the occupation of the physician who carried out the treatment of diseases by the prescribing of drugs to be taken internally and to the apothecary who dispensed the drugs the physician had prescribed Although by the eighteenth century the frontiers of these different branches of medicine were becoming very blurred and few doctors could afford to remain solely in their original speciality the naval surgeon took this merging to its fullest extent. On land particularly in the provinces surgeons practised internal medicine but there was always the physician to consult for more difficult cases The physicians were not strangers to minor surgery but again some was always left to its proper practitioner Few apothecaries simply dispensed drugs many also prescribed, but only the naval surgeon had to combine all three functions into one

Despite having to be competent in all three branches of medicine the naval surgeon was still only a surgeon He had been examined by the Company of Surgeons and was not required to pass the examinations for the Royal College of Physicians nor for Apothecaries Hall Although many of the Scottish surgeons like Cullen attended classes in physic at university there is no mention of them being examined in it In 1727 in answer to a complaint about a

surgeon's ability the Company of Surgeons retained that they could only examine a man in his capacity as a surgeon and not in physic[1]

Fever was by far the most common disorder suffered by men at sea Not only crippling and potentially lethal fever was highly contagious and so could be particularly devastating in the confines of a ship When describing a fever Surgeon George McGrath[12] of HMS *Russel* said there is none more inimical or destructive when it once gets in amongst a ships company The identification of a condition as a fever was based on the observation of a greatly raised temperature This diagnosis therefore covered a number of conditions which were only later differentiated In the list of diseases printed in the surgeon s Journal fevers were divided into two categories continuous and intermittent Intermittent fever was probably malaria whereas continuous fever might be typhus enteric or yellow fever Different types of fever were prevalent on different stations for instance yellow fever was common in the West Indies and Africa The following is a description of the symptoms of a fever which spread through HMS *Alfred*[13] in 1796 while she was stationed at Port Royal Jamaica It is typical of a case description from a Journal being extensive and detailed

> The symptoms as they appeared on board the Alfred at the worst period were prostration of strength heavy sometimes acute pains of the forehead, a severe pain of the loins joints and extremities a glassy appearance with a Bloody suffusion of the Eye Nausea or vomiting of bilious sometimes offensive Black Matter not unlike Coffee Grounds often attended with evacuations by Stool of the same kind the Stomach rejecting everything offered the Countennace flushed at other times Pale and dejected with oppressive cold sweating Bleeding at the Nostrils the Pulse sometimes for a short period full and quick but more frequently languid great thirst the Tongue white and brown at the edges frequently covered with white slimy matter and as the fever advanced became dry brown and encrusted a fatal appearance in general but particularly so when attended with frequent puking and loose stools sometimes towards the close of the disorder a small red Rash appeared on the Skin and soon disappeared leaving livid spots where it had shown itself and was always a fatal sign

The fever as described appears to have the symptoms of yellow fever which would have been very likely in Jamaica however although many labelled it so the surgeon denied this and preferred just to call it a malignant fever

Typhus was also highly likely to infect the ships at this time Thus was the same ship hospital or gaol fever that afflicted those living in crowded dirty conditions and attacked those already in poor health it could very easily be fatal The ships provided the perfect breeding conditions for this disease which was passed from person to person particularly by dirty clothing and the impressment system and the large influx of men from the crowded port towns encouraged the disease. It was probably this type of fever that was described by the surgeon of HMS *Penelope* [9]

> Anchored in Gibraltar bay where we found the *Leviathan* Admiral Duckworth *Vanguard* and *Powerful* The following day Captain Blackwood attended a court martial on board the *Vanguard* which ship at that time had a number of her crew ill of fever A few days afterwards two of the boats crew who attended the Captain were seized with it Consequently left no manner of doubt with regard to introduction of the disease on board Our people on being first attacked with this disease in general complained of Headache Pain in their Backs Nausea and prostration of strength Pulse quick and irregular and total loss of appetite with a dry parched tongue

Many remedies were attempted and the surgeons eagerly reported any success in their Journals. Surgeon Wilson of the *Penelope* who wrote the above description began using a very popular antimonial treatment Having served under Dr Lind in the Physical wards of the Royal Hospital at Haslar in the years 94 and 95 where I had an opportunity of seeing his practice successful in a number of cases marked with the greatest part of the above enumerated symptoms However Wilson found that his patients worsened he then tried blood letting accompanied by emetics and laxatives and for the more stubborn cases Blisters with Bark and wine He proudly reports that Out of the number I had ill of this disease I did not lose one nor did I send more than one to hospital

Other remedies for fever are discussed by Surgeon Warner of the *Alfred* [13] Calomel which again was a popular remedy he describes as uncertain Strong Spruce Beer which some

recommend he dismisses as he does antimony this he states is too violent so as to cause excessive debility He rejects bleeding for fear of lowering the system but says that in some cases he gave Dr Jnmes' Fever Powders' in small amounts These powders had been officially issued to the navy since the 1750s They are now known to have contained antimony and phosphate of lime and although a very popular remedy probably did more harm than good unless given with care Warner's own remedy consisted of moderate doses of Ipecacuanha on the first appearance of the complaint sometimes when puking had commenced and [he was] not dissatisfied with the practice having frequently found it beneficial prescribing the common saline treatment after it which often removed the irritability of the stomach where it failed succeeded sometimes by prescribing the saline treatment in an effervescent state

The bark mentioned by Wilson but rejected by Warner as he found the patients stomachs could not retain it was Chinchona bark also known as Peruvian or Jesuit's bark and was widely prescribed in the treatment of fevers As this bark is the source of quinine a specific against malaria it is not surprising that it was found to be particularly good remedy for Intermittent fever Indeed Surgeon Parry of HMS *Adventure*[1] wrote In Intermittent fever the Peruvian Bark is a special remedy and experience fully manifests to me that it is specific febrifuge with respect to this affection The bark was usually given in wine and is a remedy mentioned in a great many of the Journals Its usefulness in Intermittent fever caused it to be tried in all fevers but many patients found it hard to keep down.

That fever was highly contagious had been recognised by the navy since at least 1781 when a receiving ship had been set up at Portsmouth The naval surgeons were not slow to observe this and as far as possible infected sailors were segregated from the other sick to prevent the infection spreading This segregation was not confined to fever cases as Surgeon Gray of HMS *La Nymphe* recounts[21] when he discovered that six sailors had the Itch As soon as it was known that they were affected I had a berth screened in from the rest of the people and a sentinel placed over them to prevent them going out, with a view to preventing infection their clothes were also fumigated with sulphur and afterwards washed before they were returned to them on their discharge from the sick list

The ships were also fumigated and cleaned in an attempt to remove the miasmata the particles which were blamed for the spread of disease Surgeon Outram [17] during an outbreak of fever fumigated between the decks with Nitrous Acid on 18 April 1797 he repeated the procedure every three days until the fever had diminished.

Dysentery was also a disease which was well suited by the conditions on board ship and an outbreak of any size could render the sick berth horribly squalid and the air especially in hot climates could easily become stinking and foul James Grey assistant surgeon to HMS *Encounter* wrote in a preface to his Journal[23] of the conditions he found which he considered led to the dysentery on board

> When I joined the *Encounter* in Table Bay she was preparing to be hoven down her guns stores and crew were put on board the Aiduste (French frigate) which had been some time before stranded in the bay and nearly filled with water so that every person on board was continually exposed to exhortations arising from the stagnant water in the hold and tween decks—from moist putrefying wood and from the filth and dirt which the usual rough and tumble of sailors abundantly supplied The weather also about this time was variable and unpleasant and the decks so mutilated that in several places the rains fell directly into the hammocks
>
> Having remained about three weeks in this atmosphere of contagion we were removed into the Encounter but she also in heaving down had been nearly filled with water and was still very damp and uncomfortable. We were however huddled out to her and instantly sailed on the River Plate expedition with some Dysenteric patients on board besides other trifling complaints

The main symptoms of the dysentery cases of which Gray was himself one for a time were the extreme debility apparent putrescency and prolapsus ani Grey attempted to treat the cases using emetics purgatives and laxatives but finding these to fail changed his treatment to stimulants—brandy wine and camphor From the case summary at the end of this Journal it can be seen that over the period covered 24 June 1805 to 14 March 1806 there were 33 dysentery cases out of 60 persons sick (55%) but only one death Surgeon Alexander Meine of HMS *L'Amiable* also writing on dysentery,[24] noted that a particularly extensive bout of the

disease had broken out after the crew had begun to drink from a fresh cask of water After persuading the Captain to revert to the earlier cask Melen found that all the cases of dysentery cleared up From this he drew the conclusion that the cause of this outbreak of dysentery had been in the water

Another condition which was very frequently found on board ship was venereal disease Gonorrhoea and syphilis were often contracted by the sailors while their ships were in port Although the sailors were rarely allowed to go ashore in case they jumped ship women were allowed on board to entertain the men In addition women were sometimes employed in the ships as nurses The surgeons often complained about this practice as the venereal diseases which resulted raged uncontrolled in the fleet Surgeon Vegg of HMS *Aurora*[25] complained to the Navy Board that when stationed in Lisbon the ship was continually full of whores

It is interesting to note that despite the frequency of its occurrence venereal disease was not included in the list printed in the surgeon's journal The reason for this was that venereal disease was viewed differently in the eyes of the navy The contracting of this disease was not seen as unfortunate or merely careless but as sinful and sailors who had it were fined The money fifteen shillings (75 pence) went to the surgeon but generally they were against this fine The punishment discouraged sailors from presenting their complaint to the surgeon or else they would wait until the condition was well advanced Many of the seamen listed in the Journals as having venereal disease it is noted had already tried the cures of quack doctors on shore but to no avail The fine for having venereal disease was eventually abolished in 1795[16]

Women were not the only vice the surgeons complained of alcoholism was also a very serious problem When the ships were in port the sailors always managed to get hold of drink despite having little money As one surgeon wrote " The men have all been drunk these two days from lying long in harbour They have not been accustomed to take spirits it has therefore operated more fearfully add to this they have an increased allowance " The sailors were also given their traditional rum ration Although this was not an excessive amount the surgeons claimed that the men hoarded their rum in order to consume it all at once Apart from diseases directly related to drink such as cirrhosis or perhaps gout for the captain the surgeons blamed drink both directly and indirectly for other conditions. For instance, both Ralph Cuming[11] and Surgeon Andrew Smith of HMS *Renard*[27] claimed that the ease with which the sailors could procure rum led to them getting drunk and then collapsing intoxicated and laying in the open at night and that this caused the Yellow fever Alexander Gordon[28] of HMS *Overyssell* puts the high occurrence of ulcers on board down to scurvy and the immoderate use of ardent spirits from which sailors cannot be restrained whenever they are in Port However in 1796 tea was substituted for the afternoon spirit ration so the complaints of the surgeons had found at least some sympathetic hearing There was however one problem which drink certainly caused this was the number of accidents which occurred as a result of excessive intoxication The surgeons Journals describe many such incidents particularly involving falling overboard or down hatchways where the sailor was drunk at the time

The occupation of the sailor of this period practically invited accidents for the ships had to be sailed and manoeuvred entirely by hand and the sailor's duties took him both high into the rigging where he would be involved in hauling ropes, furling sails, etc and on deck and below where he could be manhandling stores or heavy equipment These manual tasks led to many cases of rupture particularly in those men who had to work while suffering from one of the many debilitating conditions which caused muscle weakness. In addition the surgeon was called upon to deal with cuts contusions and broken bones, caused mainly by such incidents as falling from the rigging or being struck by ropes sails or spars

A major problem which was a direct result of many of the accidents was the development of ulcers Those suffering from scurvy or other disorders of dietary insufficiency were particularly vulnerable and the unhygienic conditions on board some vessels aggravated the problem Even very minor cuts and abrasions if not properly cared for could develop into nasty sores In the Journal of HMS *Ardent*[10] the surgeon notes against the case of one John Handlin who had an ulcerated foot "He was a small Beer Drunkard and suffered an ulcer to spread and become disposed to gangrene before he complained " Handlin was discharged to sick quarters ashore where he no doubt underwent amputation In this same

Journal the surgeon describes the treatment given for ulcers

> John Long (Able Seaman)—sent to Argonaut, 8th February, 1798 for an ulcer and discharged with a ticket of care in April But ulcer was open and in no ways mended in appearance or like he was cured on board at sea after about two months Cure—on inflammation apply poultice mixed with extract of Saturn Camphor Garlic or stimulant antiseptic Bark opium and wine given internally Strong infusion of Garlic or Rum applied eventually—excellent effects—has appeared to snatch the patient from the jaws of death

Many surgeons gave antiscorbutics i e lime and lemon juice to cure ulcers resulting from scurvy The story of the conquest of this disease is well known and will not be repeated in great detail here However it is interesting because it shows how this disease continued to rage through ships with devastating results when a solution was widely known Even in the sixteenth century it was known that fresh fruit and vegetables were a cure but the remedy was forgotten or ignored until it was rediscovered and proved in the first clinical trial by James Lind who published his results in the Treatise of the Scurvy in 1753 It is obvious from the surgeons Journals that the works of Lind were known many surgeons make reference to him and at least one had worked under his son at Haslar For some reason though the navy did not adopt his methods until Gilbert Blane finally persuaded them in 1799 that the only way to prevent scurvy was to provide the ships with lemon juice [29] By this time however the surgeons were already keeping cases of scurvy down to a minimum having recognised the usefulness of lemon juice and lime juice and the necessity for a diet of fresh provisions on board ship It should be pointed out that lime juice was used by the navy in preference to lemon because it was cheaper however it was not so effective as an antiscorbutic Where previously voyages of any length would render the crew weak and diseased due to scurvy the surgeon of HMS *St George*[30] could state in 1798 that ships in general on the Mediterranean station when at sea were much more healthy than when in port especially when they were well supplied with Lemons and Onions In his Journal for 1799 Surgeon Richard Williams of HMS *Edgar*[31] states I have not in this Journal taken any notice of the Scurvy as I found they all speedily recovered by Lemon Juice and cleanliness

The best way to demonstrate that scurvy was no longer a problem is to quote from some of the case summaries HMS *La Virginie* 1798–1799 one case of scurvy (cured)[32] HMS *Tigre* 1797 no scurvy 1798 1799 one case of scurvy (cured)[33] HMS *Alfred* 1797–1798 no scurvy[34]

It should however be noted that although lemon and lime juice and fresh vegetables were recognised as a cure for scurvy they were seen more as a remedy than a preventive Although some surgeons did issue crews with fruit on a regular basis many gave lemons to only those who were sick or had scorbutic ulcers

The surgical rather than the physical skills of the surgeon although required in the treatment of accidents and ulcers in the sick berth on a daily basis were most evident when the ship was in an engagement The wounds resulting from enemy action that the surgeon could be called upon to treat were varied and usually extensive Large naval battles fought at close quarters could result in particularly devastating casualties The main weapon of the naval battle was the cannon and the majority of injuries sustained in action and recorded in the Journals were the result of cannon shot The projectiles fired from the cannon were not only plain round shot employed to destroy the enemy ships and immobilise their guns but also chain shot and bar shot These elongated missiles were used to disable the ships rigging and thus prevent them from manoeuvring However the results of these projectiles hitting personnel was particularly horrific also the falling rigging caused more wounds and broken bones A further type of missile grape shot or canister shot which contained a number of smaller projectiles was aimed at killing or wounding the sailors

When HMS *Lion* engaged four Spanish frigates one of the crew Seaman George Carter was injured by grape shot Surgeon James Young describes his wounds thus [34]

> Carter was wounded early in the action by a 4lb Grape shot which entering the internal part of the thigh close to the trochanter minor—past obliquely upwards shattering the bone—and made its exit on the outside just by the great Trochanter Young applied a tourniquet and amputated the leg after the action The Tourniquet being applied nearly in the groin made the first incision close to the superior part of the wound—And at the next incision through

the muscles the thigh came away without using the saw—removed all the splinters of the broken bone with the metacarpal saw—sufficient integument was preserved to cover the bone notwithstanding the situation of the wound—which at first view led to imagine it impracticable In the action one of the Spanish frigates, *El Santa Dorothea* of 42 guns was captured, but unfortunately Carter was one of those who died

As well as direct injuries as a result of cannon fire, many men were injured by the splinters produced when cannon balls smashed through the wooden sides of the ships Injuries from small arms and hand to hand fighting were also sustained When ships were engaged close marksmen were positioned in the tops to pick off sailors on the enemy s deck It will be recalled that Nelson was killed by a musket ball fired from the mizzen mast of the French Flagship *Redoubtable* [35]

The case of a gun shot wound received while a boarding party from HMS *Lion* was attacking a Greek ship demonstrates the relatively delicate and skilful work that could be carried out by some of the surgeons Again the surgeon is James Young [34]

John Evans aged 20 Seaman—Gunshot Wound in both hand by musquet (sic) balls—in the right the ball entering the back part of the hand in an oblique direction and shatter d the metacarpal bones of three fingers making its exit through the palm—in the left the shot entering nearly at the articulation of the first phalange of the thumb with the trapezium passed quite through and totally destroy d the joint—having splintered all the bones of the thumb it passed between it and the forefinger

Extracted all the loose portions of the fractured bones reduced as nearly as possible into site all the fractured ends of the metacarpal bones—Applied simple dressings with proper splints and bandages—and fomented frequently with warm dilutions of Chamomile and wormwood

The inflammation which succeeded was violent and the discharge thin and acrid—but by the continued application of Fomentations constant use of opiates—and an open belly—it at length subsided—several pieces of bone work d out—And the wounds healing—he was quite recovered on the 20th September except the use of his left thumb A proper Ankylosis having formed in the joint—Duty

Although the operation described above was carried out after the action had taken place it should be remembered that a great many operations had to be undertaken as the battle raged overhead This was not only difficult but could also be life threatening to the surgeon himself George McGrath surgeon of the *Russel*[13] describes what happened while amputating a leg during the Battle of Camperdown

he was laid on the table and the operation performed in the usual way which he bear very well indeed so much so that he did not require an assistant to hold him on the table lucky it was that he bare it so well as a shot at this time came into the cockpit and passed the table close this startled all the women who formed the chief of my assistance

The surgeons also had more obscure cases to deal with On 22 February 1800 one James Stevens a Marine of HMS *Arab* presented to the surgeon Thomas Sappey [36] having been Poison'd by a Tarantula on the leg occasioning the usual symptoms attributed to that reptile sedate melancholy accompanied with nausea and a sense of pain in the breast The good doctor s medicine must have been better than his zoology for the marine was discharged to duty on 17 March

The surgeons also came across sailors who feigned illness in order to get to hospital where no doubt they anticipated an easier life Surgeon Gordon of HMS *Overyssel*[28] writes of one such case thus of one Morris Roek

This man complains of pains which from his account no-one would hesitate to pronounce Rheumatism We must however observe neither the tongue nor pulse shewed any signs of this disease

This history of this case leaves little doubt but that this man feigned his complaints on purpose to get to the hospital

What should have been done in this? It is answered order him to his duty Such a step though proper would have exasperated the people against the surgeon whose office at present is by no means desirable We must therefore act with caution for I am of opinion that the discontents of sailors are only suspended not suppressed

Some sailors went to rather extravagent lengths to get off their ship In a note against an ulcer

case, Surgeon Outram of HMS *La Nymphe*[37] wrote 'I am much inclined to think from the general ill conduct of this man that he has applied caustic to his leg for the purpose of producing an ulcer—the deep seated black dry [illegible] and the surrounding inflammation bears every appearance of some acid or corroding substance having been applied to the skin'

Perhaps the most bizarre case to be found in the Journals is that of John Cummings as reported by Benjamin Lara surgeon of HMS *Iris*:[37]

> (Cummings) complained of excessive pain in the stomach and intestines and inability to retain anything in the stomach this being due to his having swallowed on the preceding day 19 or 20 clasp pen knives and one pen knife case the latter of which was soon after rejected but the former remained[11]

Unfortunately the subsequent Journal has not survived so we are unable to find out what happened to this man

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An Historical Note

The build-up to VJ Day and its aftermath as recorded in *The Tjitjalengka Times*

(These extracts from the locally-produced newssheet are reproduced by courtesy of Wardmaster Lieutenant Commander J Stockton RN Retd who served on the hospital ship Tjitjalengka as a SBCPO)

Introductory Note

The *Tjitjalengka* (Fig 1) was built in Amsterdam in 1939 and registered in Batavia she was owned by the Java China Java Line and used on their Dutch Indies–Far East service In 1940 she was used as a troop carrier and in 1942 she was chartered to the Admiralty and fitted out for use as a hospital ship At that time her Medical Officer in Charge was Surgeon Captain F H Hunt RN and her Senior Medical Officers were Surgeon Commander W J Fairbes Guild RN (Surgeon) and Surgeon Commander E G Reaves RNVR (Medical) She was returned to her owners in 1946 and was used on their Kobe South Africa Buenos Aires service She was finally broken up in Hong Kong in 1968

THE TJITJALENGKA TIMES.. WEDNESDAY AUGUST 15TH, 1945

President Truman announced at 0907 hours local time today that Japan had accepted the Allies Terms of Unconditional Surrender

In London Mr Attlee was at the same time making a speech to the British people A short time ago he had an interview with the King at Buckingham Palace Reception conditions made it impossible to receive Mr Attlee's broadcast Tokyo Radio has announced that a momentous statement will shortly be made to the Japanese people

GREAT FLEET OFF JAPAN While the Allied Governments await a reply to their note one of the mightiest war fleets ever assembled was cruising off Tokyo This fleet had been trying to make wireless contact with Japan, as the Japanese had been told that the Fleet would act as a wireless channel of communication with Admiral Nimitz at Guam if necessary This has not been confirmed by Washington say correspondents but if it is so the process of passing messages through normal diplomatic channels has been superseded

SINGAPORE A large invasion force of British troops has been waiting in Ceylon for the announcement of surrender It is ready to move at once into Singapore along with units of the British East Indies Fleet. It is stated that Admiral Mountbatten will have an enormous supply problem to handle in the liberated countries under his command but many supply and food ships are waiting in readiness to move in with the British forces An American invasion force is waiting in Okinawa and the Philippines all set to become the American occupation force of Japan

LARGE SCALE BOMBING RESUMED Over 1000 bombers were attacking Japan yesterday Superforts bombed two arsenals in Osaka railway yards at Hiroshima and shipping near Kure This was the first Superfort attack since the negotiations commenced 400 planes of the Far East Air Force yesterday kept up their daily attacks on Kyushu and Shikoku They left large fires burning at Miyazaki and Kushikimo They also destroyed several enemy planes a freighter and some small vessels. American and British carrier planes were over Japan again yesterday and bomber airfields etc in the Tokyo area Incomplete reports show that 46 Japanese planes were destroyed on the ground 71 were damaged and 21 shot down

Fig. 1

During the negotiations millions of leaflets have been dropped by Allied planes all over the Japanese empire giving details of the negotiations and the surrender terms

NAVAL BOMBARDMENT On Sunday US warships bombarded Matsuwa and Paramushiro in the Northern Kuriles American naval planes also attacked targets in the Tsushima Straits between Korea and Japan while Army bombers raided Fusan in Korea

RUSSIANS SWEEP ON The Russians have made big advances towards the central plain of Manchuria and latest reports say they are now within 150 miles of the capital Harbin In the east, they have captured several towns and railway stations in advances up to 30 miles In the west they have made more crossings of the Khingham mountains and may have occupied a town on the Hilar Harbin railway The Russians also report a breakthrough on Sakhalin Island

NAZIS FOR TRIAL 12 former prominent Nazis are now in Nuremburg awaiting trial as war criminals They were flown from the Army Interrogation centre at Luxemburg. They include von Papen Ribbentrop Goring General Jodel Field Marshal Keital former labour front director Robert Ley and Jew baiter Julius Streicher The trials of the individuals concerned with the atrocities committed at the Belsen Concentration Camp will probably take place next week Allied war crime investigators are searching for 10 German doctors who carried out vivisection experiments on Polish girls several of these girls are now in hospital in a serious condition

ADMIRAL NIMITZ DECORATED On behalf of the King Admiral Sir Bruce Fraser has decorated Admiral Nimitz with the Knight Grand Cross of the Order of the Bath on board the battleship HMS Duke of York

CHINA A treaty of friendship has been signed between Soviet Russia and China Dr T V Soong conducted the negotiations and agreement has been reached on all points

TAIL-PIECE There is no immediate prospect of an increase in food rations in Britain

THE TJITJALENGKA TIMES SPECIAL VICTORY EDITION TOKYO BAY, MONDAY SEPTEMBER 3 1945

Caesar was ambitious

The historic ceremony performed yesterday aboard USS *Missouri* in Tokyo Bay has finally and irrevocably liquidated the last of the three aggressor nations who for so many years have spat in the faces of the civilised peoples of the world Japan after awakening in the middle of the nineteenth century from her feudal isolation has spent the last eighty years in preparing treacherously for the attempt at the conquest of the Far East which reached its climax at Pearl Harbour one Sunday morning towards the end of 1941

It is salutary to remember that Japan eighty years ago was many hundreds of years behind the Western Nations in her way of life and that the progress she has made since then has been in large measure due to the ideas influenced and at times very generous help of those same Western Nations which she has so lately been trying to drive from the mainland of Asia and from the multitude of scattered island which sprawl across the Pacific Ocean

The history of Japan's relationship with the civilised world is bespattered with crooked dealings and base treacheries black as and much longer than those of Nazi Germany after flinging down the glove in 1932 and resigning from the League of Nations she never intended to assist Japan began her long series of aggressions by attacking Manchuria Four years later she invaded China and thus began what she deemed to call the Chinese Incident which was to continue spasmodically until yesterday

After Japan had allied herself with the two other aggressors an attack upon the United States of America and Great Britain was only a matter of time Typically the Honourable Japanese' the Sons of Heaven chose a moment when Great Britain stood alone in Europe and America was palpably unprepared to undertake a war of defence the lines of communication of which stretched across so many thousands of miles of ocean

The rest of the story is too recent date to need repetition Their ruthlessness barbarity sadistic cruelty and complete disregard for the value of human life has totally unfitted the Japanese for any consideration for a place in the councils of the civilised nations of the world We can only hope that the ceremony performed yesterday only a stone's throw from where we are lying at anchor is the symbol of a permanent and enduring peace

THE SURRENDER OF JAPAN

Tokyo Bay Sunday 2nd September

With mighty warplanes roaring overhead and surrounded by the awesome strength of the combined allied Fleets Japan's delegates today signed the document which finally enshrined their infamous attempt to stab the democracies in the back and reserve Asia for the Japanese

Although officially described as sunny the weather during the surrender ceremony was sultry overcast and windless and remained so throughout the day The quarterdeck of the great American battleship *Missouri* had been specially cleared for the proceedings The guns were pointed skywards to make more room and it seemed that every vantage point in the ship was occupied by the press and sightseers anxious to have a glimpse of the historic act of signature Just like the Derby was the opinion of one British correspondent On the inboard side of the quarterdeck stood a long row of General MacArthur's leaders including such names as Hodges Stilwell Kruger Spaatz Kenny and many others who had taken a prominent part in the campaign On the outboard side of this cleared space were ten file of Officers each comprising a national representative and his staff In the centre was a table and behind it a chair specially brought for the occasion from HMS *King George V* and behind that again were photographers press representatives and their battery of microphones

Nobody was seated at this surrender unlike previous occasions in Germany and Italy On the foreside of the table a clear area was left for the Japanese delegates

At twenty five minutes past ten a boat bearing the Japanese delegates came alongside Preceded by United States military policemen they came on board led by a very old and very lame Japanese civilian formally attired in black morning coat and white waistcoat silk top hat and yellow gloves and leaning heavily on a walking stick It was all rather pitiful This old man was Mr Shigemitsu the Japanese Foreign Minister of the last War Cabinet and the present Peace Cabinet who was authorised to be Japan's chief signatory and the personal representative of the Emperor perhaps later to be tried as a war criminal Following him were two or three other civilians with their silken top hats all looking penitent and moderately sincere Following on their heels came Japanese

military officers looking very glum and one or two of them with tears in their eyes

A silence fell upon the great assembly as General MacArthur stepped out of Admiral Halsey's cabin and came forward to the microphone In a slow and deliberate tone he explained the significance of the ceremony which was about to take place He concluded by saying. As Commander-in-Chief for all the Allied Powers I announce it is my supreme purpose to proceed with justice and tolerance while taking every step to see that these terms of surrender are fully complied with He then stood aside and motioned to Mr Shigemitsu. A Japanese civilian hurried forward to the table and placed upon it two documents in Japanese script, which represented Mr Shigemitsu's authority from the Emperor to sign on his behalf Then Mr Shigemitsu himself came forward he studied the surrender documents for a moment or two It was a square white parchment sheet about one foot by one and a half feet in area and in two copies the first in gold and red for the Allies the second for the Japanese most appropriately in black lettering After considerable difficulty with his wooden leg Mr Shigemitsu sat down at the table Then he pulled of his yellow gloves and handed them to an aide Once again he studied the document General MacArthur fidgeted with impatience it was all going much too slowly for him Mr Shigemitsu looked at his own watch he looked at his aide's watch he looked at his pen as if it was dry He was offered another pen but at this moment his own appeared to have sufficient ink and the document was signed. The Japs were all tensed and uncomfortable by then and General Umezu signing on behalf of the Japanese military authorities wasted no time with his signature General MacArthur then called General Wainwright and Lt Gen Percival to accompany him as he signed on behalf of the Allies He picked up a silver pen from the table and signed the document with a shaking hand He then turned and presented the pen to General Wainwright Taking a second pen he signed the Japanese copy and presented the pen to Percival A third fourth and fifth pen were also used by MacArthur during the ceremony and one of these will probably be presented to President Truman

Following this Admiral Nimitz accompanied by Admiral Halsey and General Sherman signed for the United States of America General Hsu Ung Chang, young and efficient looking, signed for the Republic of China Then Admiral Sir Bruce Fraser accompanied by Vice Admiral Rawlings and Rear Admiral Brind signed for the United Kingdom Admiral Fraser accomplished the feat of making two signatures with three pens These were probably also for presentation General Derevyanko signed for the USSR Sir Thomas Blamey for Australia, Colonel Cosgrove for Canada General LeClerc for France Admiral Halfred for the Netherlands and an Air Vice Marshal for New Zealand The whole ceremony has taken only fifteen minutes and General MacArthur closed it with these few words I pray that peace be now restored in the world and that God preserves it always. Let these proceedings close. The time was then ten minutes to eleven The Japanese delegates left for shore Thus peace was restored to the world

Meanwhile the occupation of the Japanese homeland continues and surrender of Japanese held areas elsewhere is expected to be completed within the next few days American air and seaborne troops yesterday continued their landings on the Japanese mainland and the first units of the American Eighth Army arrived off Yokohama in a large convoy of troopships from which they landed at various points along the waterfront Red Army and Navy Forces have completed the occupation of the Kurile Islands Rear Admiral Harcourt Commander of the British Naval Force which, for the past few days has been lying in Hong Kong harbour has now established British administration in Hong Kong Units of the British East Indies Fleet are still waiting off Penang to take over the port of Georgetown Preparations are being made in Singapore for the arrival of the British General Staff on Wednesday It is expected that on this day Japan will sign the surrender of the richest of all her conquests the Dutch East Indies Borneo Burma and most of Indo-China It is expected that Generalissimo Chiang Kai Shek will receive the surrender of all the Japanese in China on Thursday in Nanking Japanese field surrenders throughout the remainder of the Pacific theatre are expected to be completed before the end of the week Truk- largest of all the by passed enemy bases in the Central Pacific surrendered on Saturday with an estimated 50 000 troops All Japanese mandated islands including the Carolines the Marshalls and the Bonins are to surrender to Admiral Nimitz. The British aircraft carrier *Glory* is now off Rabaul where the Australians will accept the surrender of 86 000 Japanese in the

South west Pacific area Lieutenant General Yamashita swaggering one-time conqueror of Singapore yesterday gave himself up to American troops in Vaguio in Northern Luzon and is prepared to surrender formally today

IMPRESSIONS OF YOKOHAMA

Yesterday morning, while the surrender ceremony was taking place when hundreds of Allied planes were flying overhead and between twenty and thirty troop carriers were dropping anchor near the entrance to Yokohama harbour a small party from this ship was able to get first-hand information of the war in which the Japanese people are accepting the surrender and also of the bomb damage in the city A landing was first made at a quay in the dock area The dock was patrolled by American sentries and large crates were being unloaded from a cargo ship nearby Devastation was seen everywhere and the only Japanese visible were a few men and boys hauling timber by means of small carts some drawn by decrepit-looking horses others by bullocks A pathetic old man was seen digging his small patch of garden attached to his broken down shack The whole scene was one of complete desolation Large tracts of ground on which buildings had previously stood were laid waste and covered with debris and scrap corrugated iron A good many water mains appeared to have been burst and other public facilities damaged Dock basins were packed with wrecked craft of all descriptions and much large timber was floating about not only in these basins, but in the main harbour as well Not a single intact building was seen in this area Everywhere was overgrown with weeds and the general impression of this dockland was that devastation had occurred some long time ago

A Japanese aircraft carrier lay semi submerged in the main harbour completely burnt out and alongside was the United States Army Hospital Ship *Marigold* which was just berthing The ship's rails were lined with large numbers of VADs and other members of the staff Representatives of the American press complete with sound recording equipment were there to take impressions from members of staff as they came ashore

Later we crossed over to the passenger jetty side of the harbour where a continuous stream of landing craft looking rather like ants, was plying to and fro carrying troops ashore where they formed up and marched off in the direction of the Grand Hotel to the sound of rousing marches played by a brass band In this section of the city too in what was previously the fashionable quarter the general scheme was one of desolation neglect and poverty Although the devastation was not on quite such a big scale as in the dock area large tracts of land were laid waste and many buildings damaged The few shops intact had no goods on view Most of them were empty and boarded up Garden and pavement borders had obviously been neglected for many months if not years and were overgrown with weeds

Not a single cultivated flower was seen The Army HQ was one of the few intact buildings well built and rather suggestive of a bank in its construction A line of sentries was seen outside presenting arms as the Chiefs-of-Staff returned from the surrender ceremony Newspapermen and photographers were there in plenty and one an Australian who had just returned from a first hand view of the ceremony told an amusing story of how Colonel Cosgrove who signed for Canada, put his signature in the wrong place In consequence all the representatives following him committed the same mistake with the result that all their names had to be deleted and signed again Said the Australian This will cost old "Cos" a good many drinks He will certainly not be able to live down his having made such a blunder on one of the greatest days in history

The Japanese people that were seen can roughly be divided into two sections the officials and the ordinary citizens The former who wore respectable but inferior clothes, were wearing armlets describing their function and were polite and ingratiating in their attitude the latter appeared poverty stricken half starved and utterly dejected They were all sullen and took little notice of what was going on Several members of the Japanese police were seen wearing cheap navy suits ill fitting shoddy jack boots and carrying tinny looking swords They appeared generally unkempt

Perhaps a striking symbol of the whole state of Yokohama and its inhabitants was a telephone booth in the centre of the town Its paint had peeled off and its door was hanging loose on its hinges Somehow it was typical of everything in the ruined city

As we left the harbour streams of landing craft were still coming in and we noticed with pride that the sloop HMS *Hotspur* had come alongside the quay possibly having brought representatives ashore from the surrender ceremony

(The following is the text of a signal sent from HMHS Tjitjalengka to the Admiralty on 14 September 1945)

Liberation of Prisoners of War and Internees

1. The liberation and evacuation of prisoners of war during this last few days has witnessed scenes which will live long in the memory of those of the British Pacific Fleet who are here in Tokyo Bay. In the absence of any representative of the British press the following account is sent in order that the public at home may have some idea how British and Commonwealth prisoners of war are being repatriated from the Japanese mainland.
2. This is an American theatre and the American Forces are responsible for the collection and evacuation of all Allied prisoners of war. The White Ensign however has offered all available ships to assist in the evacuation and whilst matters most is doing everything within its power to ensure that content of British prisoners of war with their fellow countrymen shall be established as early as possible and maintained.
3. The British Task Force which was operating as part of the American Third Fleet at the time when hostilities ceased is now spread about the coasts of Japan and China including Hong Kong, Shanghai and Formosa, and only a part is available to assist in the repatriation from the Japanese homeland.
4. Among the ships in Tokyo Bay of Yokohama which have lent a hand in the evacuation are HM Ships *King George V*, *Duke of York*, *Indefatigable*, *Speaker*, *Ruler*, *Newfoundland*, *Troubridge*, *Apollo*, *Tromp*, *Jervis*, *Terpsichore*, *Penelope*, *Ranger*, *Wakeful*, *Brand*, *Wager*, *Whelp*, *Illustrious*, *Quality*, *Teazer*, *Terpsichore*, Elite HMA Ships *Shropshire*, *Hobart*, *Napier*, *Nizam*, *Nepal*, *Quickmatch*, *Bataan*, *Gumboat*, *Bataan*, HMNZS *Gambia*, Hospital Ships *Tjitjalengka*, *Tjerita*, Storeships *City of Dieppe*, *Fort Wrangell*, Oilers *Duplicate*, *Cherokee*, *Serbal* and *Illustrious*.
5. The first stage has been the identification of prisoner of war camps. Much was known from information given by the International Red Cross and the Japanese themselves. Further searches by aircraft from the Third Fleet carriers (including *Indefatigable*) and of the United States Army have not only revealed additional prisoner of war camps but have enabled them to be supplied from the air during the early stages. Today on the hospital ships there are unfortunately some former prisoners of war suffering from broken limbs because in their enthusiasm they allowed the food containers falling by parachute to strike them.
6. When the Allied Fleet anchored outside Tokyo Bay the first Allied prisoners of war to be repatriated were a Royal Marine and a British soldier who escaped and attempted to swim out to the Fleet and were picked up by an American patrol boat. When units of the First minded Tokyo Bay and advanced landing parties of American sailors and British sailors and Royal Marines were landed to occupy strategic advanced posts they were, in many instances met by prisoners of war who had broken camp and received them enthusiastically on the beaches.
7. Naturally those men came off in the landing craft which had taken the landing parties ashore. Before the British and American Navies had even anchored the evacuation of former prisoners had in fact started.
8. Wherever camps were known to exist parties of American, British and Australian soldiers and sailors were sent off as contact teams. These teams have gone into the depths of Japan, have found camps and with the assistance of the Allied Commander of these camps have organised the initial journey to Yokohama.
9. This journey was in the case of camps close by made on foot or by motor car, while in the more distant cases trains have been arranged or where near the coast destroyers have been sent out to finish the parties in.
10. Naval Hospital Ships were rushed into Yokohama and into Tokyo itself and all former prisoners of war are first received on board these hospital ships where they are examined medically, given baths and clothes find, and particulars taken of every man. Telegrams are sent to the next of kin.
11. Those who, owing to malnutrition or other causes are seriously sick are retained on board. Those who are reasonably fit are sent to ships for immediate evacuation. What has been perhaps more noticeable than anything else is the longing of every man to shake off the dust of Japan once and for all at the earliest opportunity.
12. HMS *Speaker* was quickly converted into an evacuation ship and within 12 hours of being warned of this duty she was filled to capacity with over 450 British Commonwealth men whose imprisonment in many cases dated from the fall of Singapore or the sinking of HMS *Exeter*.
13. Next day she sailed for the south and as she steamed through the British anchorage the ships' companies of all the British ships gave her a send off which all those who saw it will never forget. The sight of this small aircraft carrier with the ship's company fallen in for leaving harbour in accordance with naval custom but with in addition those hundreds of ex prisoners of war ranged on her flight deck shouting like mad and being cheered brought tears to the eyes and the realisation what the presence of the great Fleet in Tokyo meant to these men.
14. As the camps in the immediate neighbourhood of Tokyo Bay were cleared ships went further afield. The *Tenacious* to Hamamatsu where the *King George V* in company with American battleships had carried out a naval bombardment only a few weeks before. *Belfast* to Hamamatsu and later to Sendai. *Bayfleur* to Hokkaido. *Blake*-

fid to Hamamatsu and Sendai [redacted] *Nizam* further west

15 The resources of the Fleet limited if they were after two months away from any base, have been used to fill each of these ships with blankets, beds cigarettes, chocolates and other stores necessary for a sea passage

16 Lately each evening one or more of these destroyers has come back arriving at Yokohama just as seen from British ships at anchor the sun has set over the Mountain of Fujiyama But it is a different picture from the usual Japanese drawings It has been a scene which in many ways has reminded one of Dunkirk destroyers carrying many hundreds of passengers in all sorts of clothing crowding all over the upper decks and receiving the tumultuous cheers of all HM Ships as they went by into the inner harbour of Yokohama where the hospital ships are lying

17 The United States air evacuation is now in full swing and over a thousand men are being evacuated daily from Tokyo airport A number continue to be sent by sea in order to maintain the maximum flow of evacuation

18 Tomorrow HMS *Rulet* another escort carrier leaves with over four hundred officers and men including on this occasion a number of civilians and children They include the citizens of all the nations of the British Commonwealth and many of the Colonies The flight deck has been marked out for every kind of game and this evening a Royal Marine dance band was playing onto the island structure Forward and aft a few rather disconsolate aircraft are made fast and serve as a reminder of what naval air power has done in achieving that for which the Navy stands

19 Down below the ship has been transformed as far as possible into a passenger liner and as the Captain remarked I have never before heard the hangar called a fairyland The change may perhaps best be summed up in the pipe which was broadcast at 1800 Children to supper

20 The hospital ship *Tjitjalengka* with her American sister ships the USS *Benevolence* and *Marigold* has been doing magnificent work in looking after the really sick and in strengthening those who would soon be fit for air or sea travel There is however always a certain number who have to be kept behind and on Sunday next the *Tjitjalengka* will be sailing for Australia with over four hundred cot cases

21 Every effort has been made to enable the men of HM Ships to mix with and help those returning victims of the war who may not have seen a new white face for years and to whom in many cases the events at home since 1942 are a closed book Many too are anxious to tell of their experiences and so ease their moods As may be expected they have found a very sympathetic audience in the British Sailor

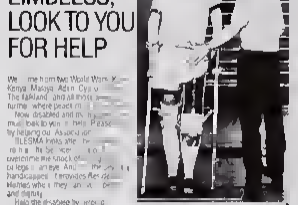
22 And so the repatriation goes on It is estimated that already a third of the total number of Allied Prisoners of War on the Japanese mainland have left Japan and it will only be a matter of days before the evacuation of Northern Honshu including Tokyo has been completed It will be as much the privilege of some of the harbours of the British commonwealth to welcome these men as it has been of the White Ensign to start them on the journey home

DON'T SAY GOODBYE SAY HELLO.

If you [illegible] have [illegible] and [illegible] a [illegible] Legion [illegible] Service [illegible] Association [illegible] you [illegible] a [illegible] new [illegible] life [illegible] with [illegible] a [illegible] new [illegible] job [illegible] and [illegible] a [illegible] new [illegible] home [illegible] you [illegible] will [illegible] find [illegible] your [illegible] friends [illegible] in [illegible] your [illegible] new [illegible] area [illegible] by [illegible] joining [illegible] your [illegible] local [illegible] branch [illegible] of [illegible] the [illegible] Royal [illegible] British [illegible] Legion [illegible] and [illegible] Women's [illegible] Royal [illegible] British [illegible] Legion.

THE ROYAL BRITISH LEGION

[illegible]



WE, THE LIMBLESS, LOOK TO YOU FOR HELP

We [illegible] from the World Wars [illegible] Korea, Malaya, Aden, Cyprus [illegible] The Falklands [illegible] and all those [illegible] further [illegible] where peace [illegible] Now disabled and [illegible] must look to you [illegible] Please [illegible] by helping our Association [illegible] BLESMA helps [illegible] to [illegible] switch on the [illegible] to [illegible] handicapped [illegible] provides [illegible] Married [illegible] they [illegible] and [illegible] and dignity.

Help be released by [illegible] BLESMA with a [illegible] legacy [illegible] that [illegible]

THE FIRST STEP
by a recent young double amputee

PLEASE GIVE TO THOSE WHO GAVE

BLESMA

[illegible]
EX SERVICEMEN'S ASSOCIATION

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Royal Naval Medical Club Dinner 1991

The annual dinner of the Royal Naval Medical Club was held in the Wardroom HMS *Collingwood* Fareham Hants on Friday 6 September 1991 when **Surgeon Rear Admiral D A Lamaliman LVO QHS** Medical Director General (Naval) gave the following speech

Admiral Black Honoured guests Members of the Club

It is with great pleasure that I welcome you to this year s Blood Red Dinner

The Club Secretary Surgeon Commander Oliver Howard has put a lot of hard work into organising this evening s activities for which we are all extremely grateful Oliver would be the first to admit that the selection of Friday 6 September occurred by chance rather than for any special reason However it could not have been more appropriate as it coincides with the 93rd anniversary of Surgeon William Maillard winning his Victoria Cross on this very day 1898 He is the only Naval Medical Officer ever to achieve this great distinction At the time he was serving in HMS *Hazard* during the Crete landings

This Club was founded some 79 years ago and Dinners have been held each year since stand fast the period covered by the two World Wars Since 1983 we are only allowed to dine in the Painted Hall on alternate years So on the intervening ones we dine either in Plymouth or in Portsmouth

Tonight we are extremely grateful to the Wardroom Mess President (Commander David Raines) for allowing us to use the excellent facilities here in *Collingwood* We are delighted he is able to dine with us

I am sure that you would wish me to extend our thanks to

1 The *Collingwood* Volunteer Band under the direction of Colour Sergeant Weston for providing the excellent musical entertainment

2 Our thanks to the Contract Caterers and to Chief Petty Officer Steward Davidson and all members of his team who have helped to prepare and serve our delicious dinner

Last Monday morning the Secretary of State was interviewed on Radio 4 prior to opening the RN Equipment Exhibition in Portsmouth To the surprise of Brian Redhead Mr King suddenly launched into a diatribe about Mr Yeltsin and Mr Kruschev I was grateful for his deliberate mistake as it reminded me of the old story of Someone once asking Chairman Mao in what way he thought the course of history would have differed if Mr Kruschev had been assassinated rather than J F Kennedy After a moment of suitably inscrutable reflection the old boy replied that he doubted if Aristotle Onassis would have married Mrs Kruschev!

Peacetime always encourages the programmers and the financiers to believe we the medical services are unnecessarily expensive

Having survived Life After Yellowlees we are now in the business of trying to survive Life After Options and The Prospect Study You will have probably seen the total post-options force levels which were announced in the national press a few weeks ago but we are still waiting for the detailed breakdown of the Medical Services In common with other support areas we are fully expecting reductions of approximately 20% commensurate with cuts in front line units

DCDS (Programmes and Personnel) the interests of which are forever in conflict is leading the review of the Defence Medical Services as part of the Prospect Study It is making rather slow progress for a number of reasons

1 It is a very complex subject.

2 Historically there has always been a great reluctance, and still is between the three medical services to re-assess their priorities rationalise their assets and make more effective use of their resources

Back in 86/87 you may remember the National Audit Office/Public Accounts Committee commented adversely on various aspects of service hospitals in particular their relationship with the NHS Since that time Ministers have never wavered in their view that certain of our Hospitals are too small too expensive over staffed and under utilised It goes without saying these accusations have never applied to Haslar and Stonehouse

When considering what may happen in the future I believe it is very important for us to remember that one of the fundamental principles of Prospect is that decisions should incline to RISK rather than CAUTION

Ministers are determined to reduce the number of hospitals to three possibly four It is their opinion that any additional secondary medical care should be provided by the NHS This decision is based presumably on the understanding that all servicemen and women are just as entitled to NHS hospital treatment as anyone else.

Understandably there has been a great reluctance by the three Medical Directors General to signing up to proposals for the future without knowing

1 The new war role
2 The size shape and location of the Post Options Forces
3 The overall rationalisation plans of the three Services which still remain unclear

It has become increasingly obvious over the last 9 months or so that it will not be possible to sustain RNH Plymouth in its present form for very much longer

1 Budget holders at all levels are facing severe financial difficulties and will continue to do so Constraints are constantly being imposed upon us It s rather like self surgery without an anaesthetic—always very painful!
2 The severe shortfall in the MA branch is still with us and likely to remain for the foreseeable future (currently 123 gapped billets) This is exacerbated by the shortfall of the EN(G)s who currently have 128 gapped billets

As far as the reprovision of secondary medical care for the RN is concerned I am pleased to report that discussions with the Plymouth Health Authority are well advanced to establish some form of integrated unit with the NHS on the Derriford site There is still a lot of work to be done in sorting out the details but providing the financial appraisals turn out to be satisfactory we are confident this new arrangement will enable us

1 To continue to look after our people in the West Country
2 By satisfying the criteria laid down by the Royal Colleges it will certainly put the training base on a much firmer footing, which is so crucial for recruiting and retention
3 It will enable us to have the best possible chance of fulfilling our war role

In summary our dilemma is to reconcile the planned reductions against our continuing need to meet the war role the peacetime commitments and the training base

As in other support areas—we are very aware that Medical resources have to be matched to an accurately defined task

Throughout the negotiations we have had to be extremely careful lest we find ourselves throwing away the operational baby with the options bath water

The Prospect Team have recently reviewed MoD with a view to significant streamlining of the top structure This will result in a small central core HQ responsible for policy formulation The implementation of this policy will be firmly devolved to the Commands who will have the financial resources to manage their own affairs which is very much in line with the principles of the NMS which went live on 1 April 1991

As things stand in our area the 2SL is programmed to move to Portsmouth at the backend of 1993 when he will get more cosy with CINCNAVHOME It will be necessary to construct a new organisation under one Commander in-Chief There is still a lot of detail to be worked out but it is highly probable that MDG(N) and his single service staff will ultimately move to Portsmouth

As we pass through this difficult period in our history senior medical management in the periphery and in London will make it their business to pass on any credible information that we have in our possession on the future development of the Medical Services

I would be very grateful if everyone could disseminate this message

One of the major concerns in the planning of Operation Granby was to try to minimise the number of allied casualties Everyone was particularly conscious that IRAQ not only possessed chemical weapons but they had already used them in the war against IRAN and against their own people

On that basis a significant medical presence was mobilised in theatre We had 1800 UK hospital beds in Saudi Arabia, Bahrain and on board RFA *Argus* which was operating in the Northern Gulf The air training ship *Argus* was converted with great speed into a 100 bed Primary Casualty Reception Ship It took exactly one calendar month from putting the plans to the Engineers at Bath on 1 October to the ship sailing for the Gulf on 31 October—a truly amazing achievement' The PCRS concept was conceived after the Falklands War but this is the first time it had become a reality Everyone is agreed it was a big bonus for such a ship to be used as an operational asset as well as a medical one

Thankfully although we had fewer casualties than anticipated *Argus* by her mere presence provided a tremendous boost to the morale and confidence of task group personnel The medical team onboard was drawn mainly from the two home hospitals and included for the first time at sea 2 WRNS DSAs *Argus* was judged by all to be one of the major success stories in the maritime operation of which we are extremely proud The Royal Navy's contribution could not have been summarised better than in General de Labilliere's signal after the War which said The RN has done a superb job out here—in the lead in any operation they can find setting standards of aggressive maritime operations that are the envy of us all

The success of the medical contribution was recognised by the award of an OBE to Surgeon Commander Paxton Dewar and the ARRC to Chief Nursing Officer Gill Comrie The dedicated HQ support was recognised by an OBE being awarded to the Fleet Dental Surgeon—Surgeon Commander (D) Geoff Myers Many congratulations to all three recipients

What is not so well known apart from those who have talked to Surgeon Commander Ross Adley since his return from the Gulf is that we also had a Naval Party of 38 medical personnel who were formed at very short notice to fill the gaps and assist 32 Field Hospital RAMC This Hospital is dual hatted with BMH Hannover for its war role They made a very significant contribution to Op Granby Not only were they the most forward British Hospital in the war zone they were also the busiest Over 61 days they treated 1250 patients and performed 105 surgical operations of which 63 were related to the land battle

Lieutenant Commander (MS) Malcolm Hazell the Officer In Charge of the Medical Squadron received a Certificate of Commendation from CINCFME for outstanding service

In addition Chief of Defence Staff's Certificate of Commendation was awarded to Surgeon Commander Mark Edmondstone for his dedicated work in DJ53b They too get well deserved congratulations

The initial policy for Reserves was that they would be asked to volunteer rather than the Government applying compulsory call out Understandably many Reservists were concerned that voluntary service would put them in a difficult position with their employers Notwithstanding this 204 RNR Medical Branch Personnel of mixed skills volunteered to serve in the Gulf This number represents just under 50% of the current bearing of the RNR which is most impressive

Understandably quite a lot of this cadre found it difficult to comprehend the lack of political will to call upon their services

One frustrated Anaesthetist and we all know what they are like (plenty of them here this evening!) immediately transferred to RAMC(V) and was in the Gulf within two weeks.

We provided a 36 strong SST to assist 3 Cdo Bde in their effort to help the Kurdish refugees This composite team included for the first time female QARNNS officers and ratings Their task was to establish and man temporary relief camps along the northern Iraq/Turkish border which stretched for 200 miles, quite a challenge

In June towards the end of Operation HAVEN ISL visited Kurdistan as well as being installed as a Peshmoga village elder he had time to visit some of the medical units He told me on his return that The Medical Squadron of the Commando Logistic Regiment gave an outstanding performance They treated 1017 Service personnel performed 70 major operations and treated 360 civilians of which 120 were admitted to hospital

They proved conviencingly that the ability to treat personnel in the field is absolutely vital

It is gratifying to see a good turnout of the RNR here tonight who are now under the new leadership of Surgeon Captain James Walsh

My information is that the overall strength of the RNR Medical Branch is to be reduced by 1200 personnel by 31 March 1992 This is equivalent to just over 20% of the present requirement The new RNR Medical Branch requirement will therefore total 4700 personnel

Although the exact role of the Medical Branch of the Royal Naval Reserve is still under

consideration the guiding principle behind the measures has been to retain those roles appropriate to the expected future tasks so the requirements remain unchanged

Regrettably this does not apply across the board and the Dental Branch of the RNR is to be disbanded This is very sad indeed and I would like to take this opportunity of paying a sincere tribute to their tremendous support to the Royal Naval Dental Service over many years

Similar sentiments apply to HMS *Essex* *Hallam* *Falaise* and *Paragon* all of whom have served us very well indeed

As well as our Collingwood guests and the private guests of club members I am delighted to welcome our two Home Hospital Padres the Rev John Rawlings from Stonehouse and the Rev Stephen Eckering from Haslar

Not only have they worked in both Hospitals but they are still doing so

We are very pleased you were both able to accept the invitation to join us this evening I know everyone in the RNMS will join me in wishing John Rawlings and his wife Ginette (herself an ex QARNNS officer) the very best of luck when he leaves the Service in December

For the first time in the history of the Club at this stage in the evening we are going to drink a toast to the memory of the late Surgeon Captain John Cliff who was the second Professor of Naval Medicine The restoratives for this toast are being provided by his brother Brian himself a retired Naval Dental Officer This evening he is accompanied by John s only son Eric. We bid them both a very warm welcome this evening.

Ladies and Gentlemen would you please rise—the toast is The late Surgeon Captain John Cliff

Finally it is with great pleasure that I welcome our principal guest Admiral Sir Jeremy Black—Commander in Chief Naval Home Command I know the duty executive officers were relieved to see him arriving at Collingwood this evening in his own Service car

Only two months ago he arrived to take ceremonial divisions in someone else s which caused a predictable amount of confusion at the main gate!

After qualifying as a gunnery officer he has had a most distinguished career

He assumed his present job in June 89 and brought with it broad experience which included command of a minesweeper HMS *Fiskerton* HMS *Decoy* HMS *Fife* and HMS *Invincible* He spent fifteen months in this ship which included the Falklands war when they spent 166 days continuously at sea

One quite often still hears around the bazaars to this day There and back with JJ Black!

What might not be so well known he has his own crunchie bar award I understand it is something between a VC and the DSO and is only awarded to members of his personal staff who give excellent service In my previous job at Haslar I owe him a considerable personal debt for his readiness to listen and wise counsel

I am delighted that you were able to accept the invitation to our annual dinner We thank you for coming and for your continued support in our endeavours Everyone in the RNMS wishes you and Lady Black the very best of luck and a very happy retirement when you leave the Service towards the end of this year

Ladies and Gentlemen I ask you to rise and drink a toast to our guests.— OUR GUESTS

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Letters to the Editor

Sir

HIGH ALTITUDE CEREBRAL OEDEMA OF RAPID ONSET

This letter relates to an expedition last year in which I the author was a participant It is intended once again to draw attention to the potential seriousness of acute mountain sickness occurring on any high altitude mountaineering trip

A case is described of High Altitude Cerebral Oedema (HACO) occurring overnight in an otherwise fit 29 year-old soldier

In May 1990 11 members of a Joint Services expedition arrived in La Paz Bolivia for a six week mountaineering trip Five of the party had previous mountaineering experience The aim of the trip was to climb three mountains over 6000 m in the Bolivian Altiplano

The team spent one week acclimatising to altitude before leaving La Paz to climb Mt Mururata (5775 m) Transport took the team up to 4100 m where upon the team climbed up through the foothills to the snow-line and Base Camp at 4610 m Acute Mountain Sickness (AMS) symptoms were displayed by a few (including the subject) but were mild consisting mainly of headache anorexia and insomnia

The following morning, the subject was barely rousable (Glasgow Coma Scale=9) He was ataxic and dysarthric disorientated in space and time with bilateral upgoing plantars but had no other focal neurological signs He had gross facial oedema Fundoscopy revealed blurring of the nasal disc margins without evidence of retinal haemorrhage His chest was clear A presumptive diagnosis of HACO was made on these clinical signs

The subject was given frusemide 40 mg iv oedema ged to drink and carried bodily down the mountain. After 500 m descent, his conscious level improved dramatically and he was eventually able to walk, aided by others He was led down to 4100 m where transport was available. Over the next few hours he had a profound dimness and a severe headache developed which settled after several days In the light of the rapid recovery no further investigations were undertaken He remained at or below 3500 m for the duration of the expedition

Many cases of HACO have been reported in the literature [1] This case is typical in many respects to other HACO cases, but attention was drawn once again to the gravity of the condition the potential rapidity of onset in fit climbers and the need for rapid descent once diagnosis is made

Yours faithfully
M D Stoneham
Surgeon Lieutenant RN

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1 Houston CS Dickenson J Cerebral form of high altitude illness *Lancet* 1975 758–761
2 North JP Cerebral oedema at high altitude *J R Army Med Corps* 1988 134 98–101

A FURTHER COMMUNICATION FROM THE FRONT

Sir

I have the honour of presenting a summary of the topics covered at the Anglo–Australian Northern Iraq Medical Society meeting held 6 June 1991 Surgeon Commander Tighe and Surgeon Lieutenant Rudland presented to the meeting various means of rehydration that they had used in the Dressing Station when dealing predominantly with seriously dehydrated children As anaesthetists they have collectively considerable experience with well established rehydration techniques however they augmented their practice with tetrasoseons and tetrapuncteal techniques Surgeon Lieutenant Rudland opened the meeting by dealing with these two techniques.

Although the percutaneous intravenous technique is usually the most desirable route of access to the systemic circulation it is often difficult, time-consuming and sometimes virtually impossible particularly in dehydrated infants The alternative intraosseous route was first described by Drinker *et al* in 1922 who used the sternal site for blood transfusion The technique was used extensively for this purpose in the 1940s and 50s but was replaced by the advent of improved intravenous catheters and cut-down methods in the 60s More recently the technique has been advocated for use in paediatric resuscitation [1] Thus author recommends using the intraosseous cannula in the proximal tibia in the under fives and in the distal tibia in older children.

Intraosseous cannulas kindly provided by Cook Critical Care have been used in accordance with the

manufacturers instructions with considerable success. All intraosseous attempts have provided a durable and reliable infusion route although the mean infusion rate of 60 ml per hour does not match the 600 ml per hour quoted in the literature. Bolus fluid infusion and in particular drug administration appeared painful. All children in whom an intraosseous cannula was sited received prophylactic penicillin.

Surgeon Lieutenant Rudland went on to briefly describe the technique of intraperitoneal infusion. Using a 23 gauge butterfly attached to an infusion set containing warmed Hartmanns the linea alba was penetrated midway between the symphysis pubis and the umbilicus with the needle pointing cranially at an angle of 60 degrees to the skin. Once the needle tip had penetrated this structure the drip was opened fully and the needle advanced. Entering the peritoneal cavity was signified by a palpable loss of resistance and a sudden increase in the drip flow rate.

It was reported that the intraperitoneal method had proved the most rapid technique mean time of insertion being 15 seconds. In one case fluid had extravasated out from beside the needle and the patient had a pyrexia of unknown origin. Otherwise those placed within the Dressing Station were uncomplicated.

Surgeon Commander Tighe dealt with the percutaneous and cut-down access to the intravascular space. Although the ideal cut-down site is probably the long saphenous vein at the ankle in those patients who are profoundly shut down it is advisable to go straight for the long saphenous vein at the groin. There developed a discussion regarding the relative merits of internal jugular cannulation in the seriously hypovolaemic patient. It was agreed that although this provided excellent access, in the severely shut down patient the technique was difficult and the consequence of a pleural tap could be disastrous.

In conclusion the intraosseous and intraperitoneal routes are valuable techniques for initial expansion of the intravascular compartment prior to siting an intravenous cannula.

I have the honour to be

Sir

Your obedient servant

S Rudland

Surgeon Lieutenant RN

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1 Drinker CK, Drinker KR, Lund CC. The circulation in mammalian bone marrow. *Am J Physiol* 1922 62:1–92.

2 Spivey WH. Intraosseous infusions. *J Pediatr* 1987 **11(5)**:639–643.

Abstracts—Papers by Royal Naval Medical Officers

Murrison AW, Smith DJ Francis TJR, Counter RE. Maxillary sinus barotrauma with fifth cranial nerve involvement. *J Laryngol Otol* 1991 **105**:217–219

A case of neurapraxia of the infraorbital nerve occurring as a result of maxillary sinus barotrauma in a diver is presented. Existing reports of a similar nature are reviewed and the pathogenesis of cranial nerve involvement in barotrauma is discussed. Guidelines for management are suggested.

Murrison AW, Lacey Emma J, Restler M Martinique J Frances TJR. Ten years of diving related illness in the Royal Navy. *J Soc Occup Med* 1991 **41**:89–93

The period from 1 January 1980 to 31 December 1989 produced a total of 244 training and operational diving accident reports involving Royal Navy and Royal Marine personnel. Because the incidence figures fluctuated widely year by year a clear trend over the decade failed to emerge. However the incidence of Type II decompression sickness as a percentage of total decompression sickness was greater in the second half of the decade than in the first a trend similar to although more moderate than recent experience of dysbaric illness amongst sport divers. Student divers were disproportionately highly represented in the statistics particularly with regard to pulmonary barotrauma and near drowning.

Murrison AW, Francis TJR. An introduction to decompression illness. *Br J Hosp Med* 1991 **46**:107–110

Decompression illness was formerly an occupational hazard confined to professional divers and compressed-air workers. With the increasing popularity of recreational diving it has come to involve a wider cross-section of the population. Furthermore the proportion of cases presenting with the more serious manifestations of the disease appears to be rising.

Journals Received

The following Journals are received regularly and are available either in the Medical Library at RNH Haslar (†) or in the Library at the Institute of Naval Medicine (*):

†Annals of Medicine' †Australian and New Zealand Journal of Surgery_ *British Medicine *British Medical Journal †Bulletin of WHO †The Charles Bell Journal (Middlesex Hospital) *Dokumentation Sozialmedizin †Guy s Hospital Gazette †International Review of Armed Forces Medical Services †Journal of Irish Colleges of Physicians and Surgeons *Journal of Naval Science †Journal of the Royal Army Medical College †St Thomas's Hospital Gazette *SPUMS Journal †Tropical Diseases Bulletin †Ulster Medical Journal *WHO Chronicle

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Book Reviews

Drugs in Anaesthesia and Intensiva Care M P Sassada and S P Smith Pp 226 Castle Horse Publications 1990 £24 00

This hardback book provides a well-organised alphabetical listing of most of the drugs commonly encountered in critical care Just over a page is devoted to each drng, with a standard layout consisting of nses chemical featnres presentation main action mode of action routes of administration and doses effects (arranged according to physiological systems) toxicity/side effects kinetics absorption distribution metabolism excretion and special points —where an attempt is made to cover drug interactions etc

This book is not intended for those learning pharmacology from scratch since understanding of pharmacological principles is taken as read Some omissions and mistakes are inevitable eg allopurinol s entry fails to mention the potentially lethal interaction with azathoprine and nitrous oxide s rate of uptake is said to be enhanced by a decrease in cardiac output whereas the rate of nptake would be decreased but the rate of indnction would be increased An inevitable problem is that the pharmacological scene changes so freqnently that most textbooks lag behind developments

Overall this is a useful book—almost essential for FCAanes Part II candidates—which provides at a glance information These details are available elsewhere bnt the authors have saved the reader the awesome effort of searching throngh multiple pnblications—a boon on the ITU at 4 am! The earrent tdition of the British National Formulary provides the latest information on drug interactions and is not displaced from its central role for clinicians who prescribe but Sassada and Smith s book is an excellent companion to the BNF

The book was carried by most of the candidates at the last I CAnaes Part II examination but it has a mnch wider potential audience and delighted the nnrses on onr ITU by providing a source of 'really nseful' facts about drugs

The anthors faced a dennting task in assembling all the data for this first edition I hope they will not shrink from the prospect of prodncing regular updates of what is snre to become a classic textbook My only regret is that I did not thank of doing it first bnt as a paperback

GLG

ABC of Major Trauma Eds D Skinner P Driscoll and R Earlam Pp 117 British Medical Jonrnal March 1991 UK £12 95 Abroad £14 50

This usefnl addition to the BMA s ABC Series is essential to the well being of all those involved in A&E work—not least the injured Adopting the ATLS system from the opening chapter and consistent adherence to its methodology throughont sneeessive chapters serve to reinforce its basic principles

Most of the nineteen chapters are clear authornative and complementary There are, however one or two weaker contribntions which are vagne woolly and contradictory and in places simply wrong Printing errors and spelling mistakes are few and the majority of the photographs line diagrams and boxes highlighting important learning points are relevant nseful and provide a readily assimilable layont which is pleasant to read There are some occasional inconsistenetes between text and photograph—like advising the tranma team to wear plastic aprons gloves and eye protection bnt no photograph in the book depicts this

Chapters on paedtatric tranma tranma in pregnancy and handling distressed relatives are partienlarly welcome containing much sound and sensitive instruction

David Yates final chapter on scoring systems challenges A&E specialists to determine whether their department provides an acceptable standard of care by comparative audit of their results

It is encouraging to see this eminently practical baudbook produced by British doctors, and its contents should become as familiar as its cover in A&E departments throughout the country **CPGB**

Increase in subscription rates

Subscribers are reminded that the annual subscription has been increased from **1 January 1992**. The new rates are as follows:

1. RN and RNR medical and dental personnel on the active or retired list, Consultants to the Royal Navy Medical Service and QARNNS personnel, other Service or civilian personnel —**£12 00 a year post free**

2. Personnel as above, aged 65 years and over who have subscribed continuously for 25 years or more—**£9 00 a year post free** however there will be no increase for those subscribers who already pay the reduced subscription of £5 00 a year.

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Subscribers are therefore requested to complete the attached proforma and return it to the Journal Office as soon as possible.

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Please pay Lloyds Bank plc, 20 High Street, Gosport, Hants PO12 1DE, Sorting Code 30-93-56 for the credit of the JOURNAL OF THE ROYAL NAVAL MEDICAL SERVICE (Account Number 0022700) the sum of £12 00 (Twelve pounds) commencing on 1 January 1992 and thereafter on 1 January each year until further notice in writing, and debit my account accordingly.

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Account to be debited								

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.....

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Request for information

Royal Naval Hospital Gibraltar

Any information on the closure of the old Royal Naval Hospital Gibraltar and in particular of the small adjacent chapel which it is understood contained a very fine font and east window would be appreciated by

Mr H R Boyce
52 Lenfune Way
Lymington
Hants SO41 9FF

Anyone who feels they may be able to help is requested to write direct to Mr Boyce.

Queen Alexandra's Royal Naval Nursing Service

Kathleen Harland MA

This book was commissioned to be written by Kathleen Harland for the QARNNS Centenary celebrations in 1984. The high cost of publishing and corresponding lack of funds put the project into abeyance until it was brought to the attention of the Editorial Committee of the Journal of the Royal Naval Medical Service. Only through the financial backing of the JRNMS who have acted as publishers has it been possible to print the book.

Mrs Harland has written a comprehensive account of the History of QARNNS from their inception in 1884 up until 1988. It is a book which combines history general interest and some anecdotes in an easy to read style. She relates the initial antipathy to females being attached to the Royal Navy, the conditions under which some QARNNS Officers served in WW2 and describes the trials of service during the Korean War and latterly the effect of the Falklands War. The book will be of interest to historians in particular the comprehensive tables at the back of the book which cover a diversity of subjects including Honours and Awards and Establishments where QARNNS Officers have served. A wide selection of photographs provide contrast and further interest for those people who may prefer just to browse through the pages.

The book costs £8.50 which includes postage. For those who can collect direct from the Office of Surgeon Commodore (NMT) the cost will be £7.50. To order a copy of the book you are requested to complete the form below and send to: ISTO Office of Surgeon Commodore (NMT) Monckton House Institute of Naval Medicine Alverstoke, Gosport Hants PO12 2DL.

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Journal of the Royal Naval Medical Service

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Obituaries

Surgeon Commander Trevor Stanistreet Law MBE DO Royal Navy died suddenly at his home in Shotley Suffolk on 3 March 1991 at the age of 68

Surgeon Commander J B Gill MO Royal Navy writes

Trevor Law trained at Liverpool University Medical School qualifying in 1945 and entered the Royal Navy for Short Service as an Acting Surgeon Lieutenant on 20 September 1946

Appointments to HMS *Pembroke* for the RN Orthopaedic Rehabilitation Centre, Bromley and to HMS *Osprey* for RNAH Sherborne as Medical Officer Surgical Section followed. He was confirmed in rank as Surgeon Lieutenant 20 September 1947 and granted antedate of seniority to 20 March 1947 before an appointment to RNH Haslar (Surgical Division) in April 1948. Seagoing postings followed to HMS *Ocean* and HMS *Glory* before transfer to the Permanent List on 14 June 1950. While serving in HMS *Glory* an aircraft crash landed on the deck among other planes causing many casualties. Trevor with the help of an SBA operated throughout the night and was awarded an MBE in the New Years Honours 1951

Following a posting to HMS *Fisgard* in 1952 he was then in charge of the orthopaedic wards at RNH Chatham. On completion of a course he was posted to RNH Plymouth in 1953 as Orthopaedic Specialist and was promoted Surgeon Lieutenant Commander in March 1954

Having first come under the aegis of the gifted Surgeon Commander (as he was then) Murchison who encouraged him in surgery for which he showed a natural ability his career underwent a change of tack and he was sent on an ophthalmic course before postings to RNH Plymouth in 1957 and RNSQ at HMS *Ganges* 1957 to 1960 as Ophthalmic Specialist

At a time when medical officers appeared to be encouraged to know more and more about less and less Trevor was an invaluable and hard working member of the RNSQ with his wide experience of surgery orthopaedics and eyes. He did cold (and the antiquated theatre was just that) lists as well as being on call for all emergencies among 200 Boy Seamen. Obtaining his DO in 1960 he was appointed to HMS *Forth* as Squadron Medical Officer and was promoted Surgeon Commander in December 1960. Following a course he served in RNH Haslar as Ophthalmic Specialist in 1961 before returning to the Boys Training Establishment at HMS *Ganges* as Ophthalmic Specialist where he remained until being placed on the Retired List at his own request on 30 April 1969

Trevor was never an easy man to know being reticent, modest and self-effacing, attributes which might be considered old fashioned today. However he had a sharp mind and confidence in his own judgement which made for a happy working relationship. He was a doctor with whom you would be to go to sea. Not the most 'passer' of medical officers he never set much store by 'Daily Orders' or buying new items of uniform and generally had an uneasy truce with the Executive Commander

Most things Trevor did were done at the rush and he tore around the Suffolk countryside—writing off several cars in the process—while at various times assisting the local Consultant Ophthalmic Surgeon and doing ophthalmic lists at British Military Hospital Colchester and locums in General Practice

In poor health when he retired he joined the local practice (at first on a part time basis) against all medical advice. He was particularly successful in General Practice which he greatly enjoyed before finally retiring in 1987. In retirement he developed a love of music and was also an active member of the Orwell Astronomical Society whose 10 inch reflector is one of the largest in private hands being especially interested in the Planetary and Lunar section

He was a doctor whose good sense, integrity of mind and generosity of spirit won him the respect and affection of his patients and colleagues. Janet whom he married in 1947 two sons Michael and Nigel and daughter Rosemary (who is a doctor) survive him

Surgeon Commander Alan John Hirst Royal Navy died 2 July 1991 after a short illness

Surgeon Captain R D Carr Royal Navy writes

Surgeon Commander Alan Hirst was a true Naval general practitioner. During his initial Short Service Commission he spent a great deal of time at sea. While serving in the Far East he married his wife John a QARNNS sister and undertook his first Families Clinic appointment.

On leaving the service Alan entered general practice and was to spend many happy years in a three-man practice at Kingswinford in the West Midlands

There he developed his interest as a police surgeon and became a Justice of the Peace. He also managed to improve his golf!

However, this time of the Navy never left Alan and in 1975 he rejoined the Royal Navy. He was to become one of a small group of Naval GP Trainers. His instinctive interest in people, his sensitivity as a doctor, combined with natural good humour made him well suited to teaching. During his time in Gibraltar and Hong Kong he was able to impart his wisdom to many young trainees.

Alan always felt the Navy to be a great family. He was immensely proud to be a Surgeon Commander, Royal Navy, and regarded it as a unique privilege to serve both as an officer and a doctor. Even during his final illness, borne with such fortitude, he was always the kind, generous, approachable individual loved by all who ever met him.

He is survived by his wife, Julia, and their three children.

Surgeon Captain Richard Thomas Cormier FRCS Royal Navy died whilst fishing on the Spey in Scotland on 7 June 1991, aged 46.

Surgeon Captain J O'Neil Royal Navy writes.

Dick Cormier was a quiet, modest man. To give an account of his life, his attitudes and his achievements is difficult, not from a requirement to find something to write, but more from the necessity to decide what can reasonably be left out without distracting from a pen picture of a life that was varied, self disciplined, demanding, so full of achievement, and which showed all the potential for future stardom. The diversity of Dick Cormier's interests, intellectual spurring, professional and social were envied and admired by friends and professional colleagues alike.

He was born in Woking in 1945 and spent his formative years living in Bromley in Kent. He went to school at St Dunstan's College in Catford and after his A levels, although he could have chosen from a variety of careers, his choice of career was a reflection of the man, in that he chose medicine and went to Charing Cross Hospital Medical School in 1963.

Once there his academic potential was demonstrated when he was awarded the Ophthalmological Institute Prize in his final year. Whilst at Charing Cross he joined the Royal Army Medical Corps as a medical cadet in 1965. He gained his Conjoint Diploma in March 1968 and later that year qualified MB BS.

Pre registration house jobs at Charing Cross and Wimbledon followed and it was at this early stage he decided to embark on a career in ENT surgery.

His career progression led to ENT jobs in Germany, Cyprus, RAF Cosford and RAF Holton. He was made a specialist in ENT in 1971 and senior specialist in 1973. In 1979 he was appointed as a senior registrar on secondment to the Royal Marsden Hospital and St Georges Hospital in London where he was described by Mr Henry Shaw as having given exceptional service in showing not only enthusiasm and interest in his work but a great willingness to take on all kinds of additional load. In particular as a senior registrar he organised single handedly an international symposium on head and neck cancer involving over 120 international delegates and speakers. This perhaps was the first public acknowledgement of one aspect of his undoubted talents that he had a voracious appetite for additional responsibility and having untapped an increasing work load he always delivered the goods and always did it well.

Dick was one of those irritating people who was good at everything to which he turned his hand. In sports he was a better than average golfer and represented his medical school. He played full back at rugby to a very high standard and represented both his medical school and the Royal Air Force. He was a good shot, an avid fisherman and a yachtsman. He was a true competitor. He enjoyed winning, and probably hated losing, but you would never know that because he was always as generous in defeat as he was in victory.

At medical school his awesome ability to turn his hand to anything and be the best led one of his fellow students to write in their year book, 'I wish I knew as much about just one subject as Dick Cormier appears to know about everything'.

In 1975/76 he was one of the crew of Great Britain II in the Round the World Clipper Race and sailed the second leg from Sydney to Dover. His qualities as a member of the team were outstanding and although he was selected primarily because he was a doctor such a vital skill in these adventures his skippet at the time was of the view that he would have been selected for the crew even if he had not been a doctor. It was fortuitous that on that trip he himself was the only casualty when he injured his hand. Perhaps that was the spur that made him sit down and write his book called 'The Yachtsmans Doctor' published in 1980.

His sailing adventures were continuing even at the time of his death. He was part of the race committee for the 1993 Round the World Yacht race. He brought to that committee his yachting experience, his medical expertise and a special interest and responsibility in the possibility that a disabled crew might take part in the race.

This last aspect of his involvement demonstrates one of the characteristics that made Dick so special and that is his unquestionable kindness. He willingly gave up time to friends in need to colleagues to anybody who needed help. He was involved with his wife in the riding for the disabled and he was the treasurer for Mencap in Salisbury for many years. He will always be remembered as a kind man to whom many of his wide circle of friends owed a lot.

In 1977 he decided to transfer to the Royal Navy in a style which was entirely in keeping with his character. This night that he transferred a party was convened in the Medical mess at RNH Haslar. He wore a specially tailored uniform, half light blue and half dark blue, a half and half cap and the half Biggles moustache was scraped off but face heavy hooded at midnight. He remains the only person to date to have

entered the Royal Navy Medical Service in the autumn of both barrels from two 12 bore shot guns out of the medical mess windows

He was promoted Surgeon Commander in 1980

He continued his training and was appointed Consultant ENT surgeon in March 1980 and Consultant Adviser in ENT to the Medical Director General (Naval) in February 1982

He worked as a consultant at RNH Plymouth for two years before in 1982 moving to Haslar where he established the Royal Navy's premier ENT unit. In spite of his farm fly settling at the farm near Clearbrook in Devon he never again worked in the Plymouth area.

In 1987 he was appointed PMO of HMS *Illustrious*, where he made an immediate impact. His wide interests outside the service and outside medicine endeared him to the whole ship's company and his capacity to involve himself with boundless energy in whole ship commitments gave him an enviable reputation as an all round Naval Officer

In 1989 on leaving *Illustrious* he was one of the pioneers of the New Management Strategy for MOD(N) and took up the post of NMS Coordinator. He had little previous knowledge to equip him for the post and yet with his ability to learn and assimilate new ideas and concepts he rapidly became familiar with the requirements of the work. He was also seen to have developed within this task a degree of tact and discretion working within a Triservice environment. His flair for staff work emphasised his outstanding potential as a senior Naval Medical Officer and only the requirements to mount his own specialty due to staff shortages prevented his progress in that area.

He returned to Haslar to continue his work in ENT in 1990 and in December 1990 he was promoted Surgeon Captain.

Throughout his clinical career he contributed to medical literature with several papers in his field and in 1980 he published An Atlas of Temporal Bone Surgical Anatomy. He had many papers on the treatment of carcinoma of the pharynx in preparation at the time of his death

In his dealings with the service, his professional colleagues and patients he was a man who held two principles absolutely—loyalty and integrity. He had a vision for the future of his specialty and he believed that its future salvation lay in its consolidation around one centre of excellence and in that belief he refused to compromise on either of those principles of loyalty or integrity. His was the penalty that having opted to settle his family in the Plymouth area, he commuted himself and his family to the unnecessary emotional deprivation and the loneliness of weekly commuting, because that was the best for the service and his specialty and his loyalty to both was paramount.

Duke pursued a lifestyle that many of us would have found intolerable and yet it was so full of achievement in so many spheres. He was a painter of watercolours he could walking stinks he designed and built cross country riding courses he was learning to handle horse driven coaches. He was a gliding pilot a wind surfer and he was in the middle of all this studying for his Masters by in Business Administration with the Open University. Duke enjoyed life to the full.

His sudden tragic and premature death will affect us all but none more than his wife Avril and children Hilary and Paul and Simon who sadly will never understand what has happened. Our thoughts go out to them.

We have received the following reminiscence of the late Surgeon Captain Philip Wallis Edmundson FRCPath Royal Navy from *Mr J P B Morris OBE* Institute of Naval Medicine.

It is with some hesitancy I respond to the Editor's invitation for personal memories of Ed. There are so many stories, only a few of which I can vouch for!

I served with him in RNH Stonehouse where he was appointed pathologist in 1953. We had heard about this bravely dedicated man from his students at the Royal Naval Medical School and knew that his objectives were to increase standards and efficiency in the Naval Pathology Service.

We soon learned that Ed was a leader who could fly into awful tempers if he thought his staff were giving less than the best. Like the sisters and sickbay men on his wards, we also discovered that he was always willing to teach and learn, and that he quickly became a friend as well as a boss. His was unmarried and at that time his only love appeared to be Bessie the British racing green 1928 3.5 litre Bentley. If we had trouble we had only to ring his cabin to hear the roar of the car coming from the Medical Mess. I was once allowed to drive Bessie to RM Eggmouth to collect blocks for an immunology study. I was instinctively pushing him to the top on the old Exeter bypass when Ed complained that at that speed I should drop to 3rd gear. He had a share in a greyhound with Peter Oliver the GU Specialist and the two argued with Surgeon Commander Jim Slade-Baskins, the ex TT rider about the relative acceleration of car motor bike and animal but I can't remember if a trial was ever held.

Ed was a classicist and sometimes sent his reports in Latin. I also remember a long correspondence in Greek with the Radiologist who had been sent a leg from the PM room and was not pleased. Ed hated slovenliness and if a MO sent a Lab Request "Urine?" he would. Agree that the sample looked like it. He insisted that his staff gave precise oral reports and disliked swearing. On one occasion Ed waved me away from the morning session at the immunology bench and ordered a trainee lab hand to report the plates. Young Marsh was so nervous he dropped a TB culture and swore F*** Me. I leapt forward with the Lysol but Ed was quite unmoved and lectured Marsh on the merits of developing his own unique swear words/phrases. His own mantra to relieve feelings or command attention was FRITTLER MY WIG. In the first Act of the hospital pantomime Babes in the Wood held three weeks later the SHPO playing the Red Baron Munchhausen stomped on stage mumbling

with monocle and red face, hunched his shoulders and shouted 'Fruit! My Wig!' He stopped the show!

I could go on about the time I was made to explain to the lab staff the significance of a bowl of bulbs sent to him by the Sisters at Christmas. They were narcissi, and I was the only one who had laughed! Or whom I was ordered to tell Ed what lies was in the grave because he had overheard me ask the laboratory Chief Jim Gilbert if the old man was in.

I moved from Plymouth in 1954 for duty at the MRC Radiobiology Unit, Harwell. Soon after Ed relieved Surgeon Commander Colin Hunter as pathologist at Alverstoke and came to Harwell on course. We initiated studies into haemopoesis in chronically irradiated mammals which he subsequently controlled from Alverstoke visiting most weekends. He was shy about his research abilities but worked very hard and was well liked by Sir John Loutit and Dr Robert Mole who were then Director and Deputy Director respectively. He became well known because he liked working to classical music and on summer weekends, the 'Emperor' used to boom out over the airfield. Ed became one of the best technicians among the pathologists I worked with and thoroughly tested all the methods described in our published papers.

A few years after I left in 1959 Ed was appointed to Harwell to lead a joint service study into the Relative Biological Efficiency (RBE) of neutrons using a goat model. He had an army vet, a succession of RAMC and RAF lab technicians and a number of ex jockey animal technicians. They were obviously a happy and successful team and it was about this time that Ed was promoted Surgeon Captain and gained his FCPath. He eventually retired from the Navy and stayed on with the MRC doing this same work.

Ed never married but he was deeply interested in the welfare of his staff and their families and for many years looked after two fatherless wards. The delight he showed in choosing their birthday and Christmas presents made us wonder why he had never taken the plunge, and it was many years before I became aware that he looked after his mother and a severely disabled sister at the cottage in Thame. I am deeply grateful for the numerous I have of their garden and his hospitality.

Mr Norman Lester Rowe CBE Consultant Emeritus in Oral and Maxillofacial Surgery to the Royal Navy died 4 August 1991 at the age of 75.

Norman Rowe was educated at Malvern College and received his dental and Medical education at Guys hospital. After qualifying, he worked in general dental practices before joining the Royal Army Dental Corps where he served as a Captain from 1941 to 1946. After D-Day he was attached to a forward casualty unit dealing with maxillofacial injuries. It was this experience that prompted him to make a career in maxillofacial surgery which he followed after the war.

In 1947 he was appointed as a trainee specialist in the plastic surgery and jaw unit at Hill End Hospital St Albans and at the inception of the National Health Service in 1948 was made a senior registrar. He was later appointed consultant in oral and maxillofacial surgery at Rooksdown House Basingstoke then a plastic surgery jaw injuries and burns unit. He organised the development of services in his specialty for the South West Metropolitan Regional Hospital Board setting up out patient clinics and establishing operating sessions at various sites.

In April 1959 the Rooksdown House Unit was closed and transferred to St Mary's University Hospital at Roehampton where he continued to develop an outstanding national and international reputation in the following 21 years. He was one of a small group of oral surgeons who established in 1960 the British Association of Oral Surgeons now the British Association of Oral and Maxillofacial Surgeons, becoming president 1969 70.

He is survived by his wife Cynthia whom he married in 1938 and their son and daughter.

We have recently learnt of the death of Surgeon Captain H E B Cunjal Royal Navy on 18 May 1991 of Surgeon Lieutenant Commander C A J Sampson RN VR on 4 April 1991 and of Mr R H Franklin CBE Emeritus Consultant Surgeon to the Royal Navy in September 1991. Any personal reminiscences will be welcomed by the Editor.

It has also been brought to our notice that the Royal Australian Navy's leading consultant in plastic and reconstructive surgery **Surgeon Commander Richard Newing FRCS RANR** died at the age of 68 on 10 December 1990. It is understood that Surgeon Commander Newing was medical officer on board HMS *Amethyst* during the historic run through the Yangtse River in 1949.

It is with regret that we announce the death of Air Marshal Sir Nigel Mills, KBE, CBE, QHP, MB, BS, FRCP, FRCGP, FFOM, DAvMed, RAF, Surgeon General and Director General of Medical Services (RAF) on 16 October 1991.

As this Journal went to press we learnt of the death of Surgeon Rear Admiral James Cox OBE on 22 November 1991. An obituary will be published in our next issue.

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SERVICE NEWS

ROYAL NAVAL MEDICAL AND DENTAL OFFICERS

HONOURS AND AWARDS

OPERATION GRANBY HONOURS LIST

Officer of the Order of the British Empire
Surgeon Commander E P Dewar
Surgeon Commander (D) G W Myers

APPOINTMENTS AND PROMOTIONS

As Surgeon Commodore (Naval Medicine and Training) 20 December 1991
A M Hazell

As Medical Officer in Command Royal Naval Hospital, Gibraltar 5 November 1991
Surgeon Captain M MacLeod

As Consultant Adviser in Applied Physiology to Medical Director General (Naval) 1 June 1991
Surgeon Commander T J R Francis

To Surgeon Lieutenant Commander
J Bedford C A C Broome-Smith J Chavasse G L Greenslade G A Hill P A Hughes A W Lambert, C D T Low M H Lygo A P Newton R A Ross P C Young

To Surgeon Lieutenant Commander (D)
N J Mallon

To Surgeon Lieutenant
P Billingsley P E Howden G A H Johnson S J Leigh Smith R Miles E A Nicholls S M Tollan M S Turner S A L Whiter

To Surgeon Lieutenant (D)
J J Marney

To Acting Surgeon Lieutenant
D S J Blair L B Cannon D J Connor F R Cook L S Davies N G Fishn D J Kerr D S Mallitt D A Newton D W Oliver B P Powell J D Ross R C Thomas N J Yarnall

Provisional intimations for promotion to date 31 December 1991

To Surgeon Captain
E P Dewar OBE R E Lambert

To Surgeon Captain (D)
J Hargreaves

To Surgeon Commander
D C Brown R F Dale M N Jeffrey W R Saywell C J Stoot

To Surgeon Commander (D)
E A Ball

HIGHER QUALIFICATIONS

Surgeon Commander C P G Barker—MS
Surgeon Lieutenant Commander M M Parrish—MRCGP
Surgeon Lieutenant Commander P R Westwood—MRCGP
Surgeon Lieutenant Commander R C Cubb—DRCOG
Surgeon Lieutenant C A C Broome—MRCGP and DObstRCOG

CONSULTANTS SENIOR SPECIALISTS AND SPECIALISTS

The following professional advancements are announced

Consultants

Orthopaedics
Surgeon Commander D W Somerville—March 1991

Pathology
Acting Surgeon Commander C M James —November 1990

Senior Specialists

Urology
Surgeon Commander D N Tulloch

Occupational Medicine
Surgeon Lieutenant Commander M S Smith

New Ambulance for HMS Drake
MDG(N) Surgeon Rear Admiral D A Lammiman being shown around the new ambulance by the PMO HMS Drake Surgeon Captain R D Curr. Several modern vehicles have recently been delivered to establishments by PSTO(N). They are a major improvement over their predecessors and should enable the Royal Naval medical service to provide the same services as currently available in civilian ambulances

TRANSFERS TO FULL CAREER COMMISSION

Surgeon Commander S S Radont
Surgeon Lieutenant Commander D A Hett
Surgeon Lieutenant Commander F J S Nicol
Surgeon Lieutenant Commander A P Roberts
Surgeon Lieutenant Commander P A Hughes

NEW ENTRIES

Surgeon Lieutenant Commander I R Macfingann
Surgeon Lieutenant Commander (D) A M Jordan
Surgeon Lieutenants A T Dewhurst G H Ogden
G Wood
Surgeon Lieutenant (D) C A Murray
Surgeon Sub Lieutenants D A Freshwater
(Miss) L M Sowden K Sullivan J B Whiteside

PLACED ON EMERGENCY LIST

Surgeon Lieutenant Commander D N Jones
Surgeon Lieutenant Commanders (D) N B Baker
J C S Kilbee
Surgeon Lieutenants G L Greenslade
G R Jones K H Keen
Surgeon Lieutenant (D) R M Winstone

RETIREMENTS

Surgeon Captain C W Millar
Surgeon Commander A E Rampling

Surgeon Commander (D) G H Rhimes
Surgeon Lieutenant Commander C F Swindells
Surgeon Lieutenant D B Murry

News of Serving Officers

Surgeon Captain J R Harrison has been elected **Chairman** and Surgeon Commander J J W Sykes **Secretary of the Tri-Service Occupational Medical Board** for the 1991–1993 session.
Surgeon Commander T J R Francis has been awarded a **Smith and Nephew Foundation Training Grant** and also the **Gilbert Blane Medal for 1990**.
Surgeon Commander T R Douglas Riley has obtained a **Diploma in Sports Medicine**.

MEDICAL SERVICES

AWARDS

The Sick Berth Petty Officer's Efficiency Medal for 1990 has been awarded to Chief Petty Officer Medical Assistant P G M Marulli de Barletta.

PROMOTIONS

To Lieutenant
T M McAnsh P Simpson

To Acting Sub Lieutenant
M J Howells I M Phillips

CONFIRMED IN RANK

Sub Lieutenants P L H Chilcott
B R Richards W M Durning

RETIREMENTS

Lieutenant Commander J K Millward

QUEEN ALEXANDRA'S ROYAL NAVAL NURSING SERVICE

HONOURS AND AWARDS

We must apologise to Chief Nursing Officer J N Last whose award of the Royal Red Cross in the 1991 Queen's Birthday Honours had inadvertently been omitted from the Summer 1991 Service News.

OPERATION GRANBY HONOURS LIST

Associate of the Royal Red Cross
Chief Nursing Officer G M Comrie

APPOINTMENTS AND PROMOTIONS

As Matron, Royal Naval Hospital Haslar
23 December 1991
Chief Nursing Officer C M Poole ARRC

As Matron, Royal Naval Hospital Plymouth
16 August 1991
Chief Nursing Officer G M Comrie ARRC

As Matron, Royal Naval Hospital Gibraltar
31 July 1991
Superintending Nursing Officer I B Gauld

To Chief Nursing Officer
I B Gould

To Senior Nursing Officer
R T Griffin S J Spencer S J Varney

HIGHER QUALIFICATIONS

Senior Nursing Officers D V Aldwinckle and A J Nutbrown have gained the **Diploma in Occupational Health Nursing**.
Senior Nursing Officer G E Watkinson has gained the **Certificate in Education**.

NEW ENTRIES

Nursing Officers T M Hopper
E A Hall

WITHDRAWN ON COMPLETION OF SHORT CAREER COMMISSION

Senior Nursing Officer T Hooke

RETIREMENTS AND RELEASES

Chief Nursing Officer J N Last
Superintending Nursing Officer P V Bacon Upshon
Senior Nursing Officers G J Kirby
S C A Meldrum
Nursing Officer C Hicks

ROYAL NAVAL RESERVE

PROMOTIONS

To Surgeon Lieutenant Commander
Andrew M Davison (*Ceres*)

To Lieutenant Commander (MS)
M Raven (*Hecate*)

NEW ENTRIES

Surgeon Lieutenant Commander G M Helliwell (*Mercia*)

PLACED ON RETIRED LIST

Surgeon Lieutenant Commander G M C Paterson **RD**
(*President*)
Surgeon Lieutenant Commander P M Thompson **RD**
(*President*)
Surgeon Lieutenant Commander K J Gill
(*Flying Fox*)
Surgeon Lieutenant Commander R M Simpson
(*Cloverhouse*)

Surgeon Lieutenant Commander R B Keston
(*Caverhouse*)
Surgeon Lieutenant Commander D K Calderwood
RD
(*Canperdown*)
Surgeon Lieutenant Commander (D) I A Ball RD
(*Flying Fox*)
Surgeon Lieutenant A J Howcroft
(*Falaime*)

RESIGNATIONS

Surgeon Lieutenant Commander G A LaFeria
(*Dalriada*)

Surgeon Lieutenant Commander M G Bratton
(*President*)
Surgeon Lieutenant Commander E F Collinson
(*Vivid*)
Probationary Surgeon Lieutenant I R Maclennan
(*Southwick*)
Probationary Surgeon Sub Lieutenant (D) C S
Lambert
(*Flying Fox*)

REMOVED FROM ACTIVE LIST

Surgeon Lieutenant Commander M L Brown
(*President*)

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Subject Index